

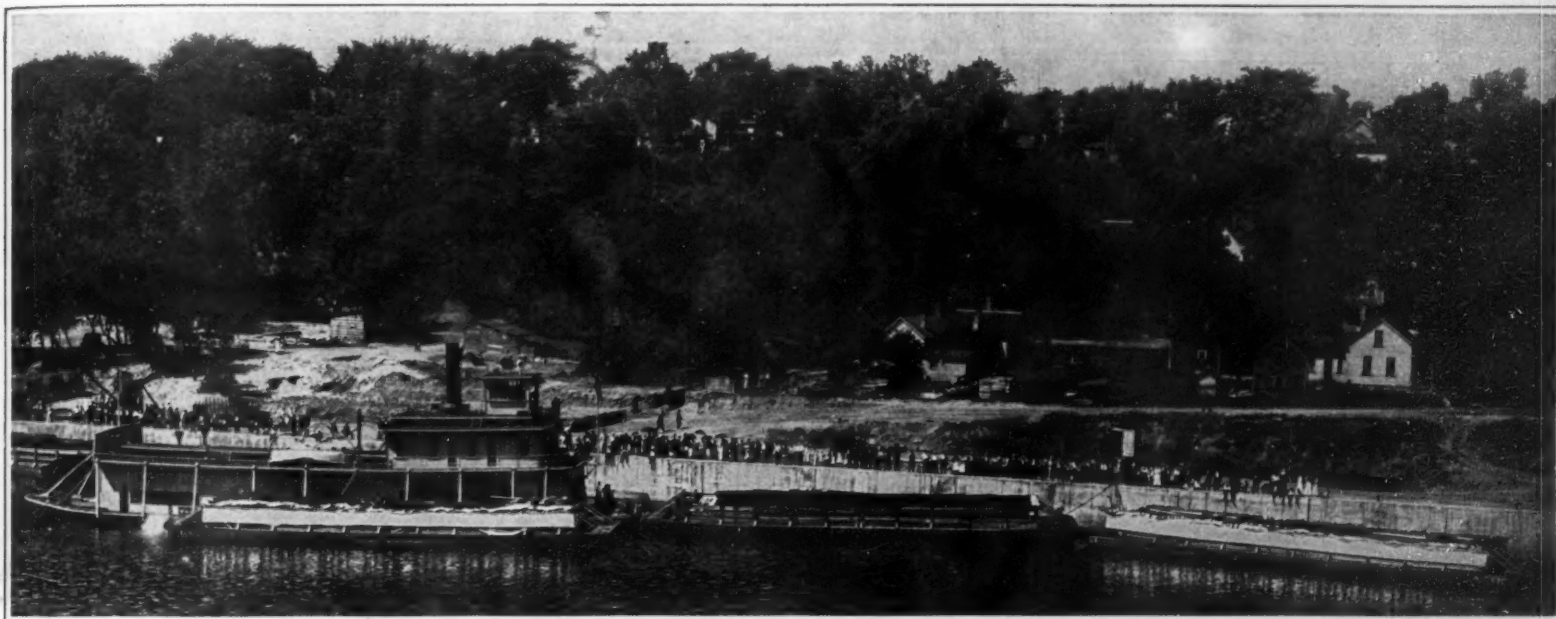
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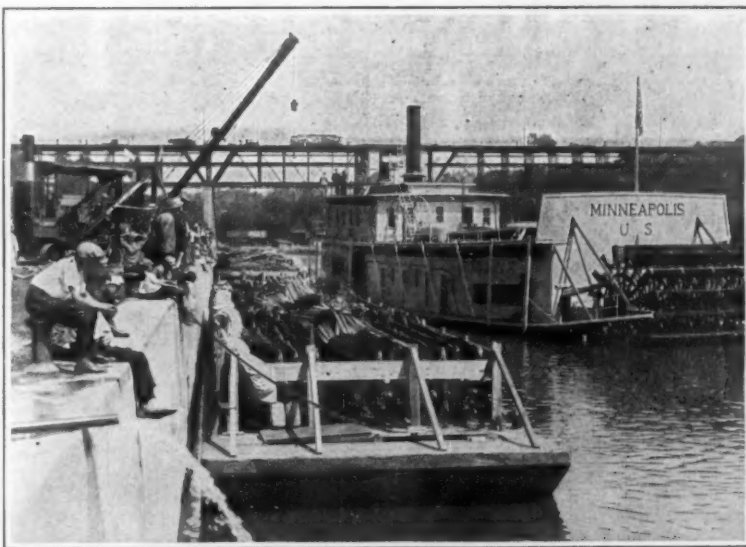


A shipment of plows from Moline, Ill.; the first freight that came to Minneapolis by water, before the wharves were finished

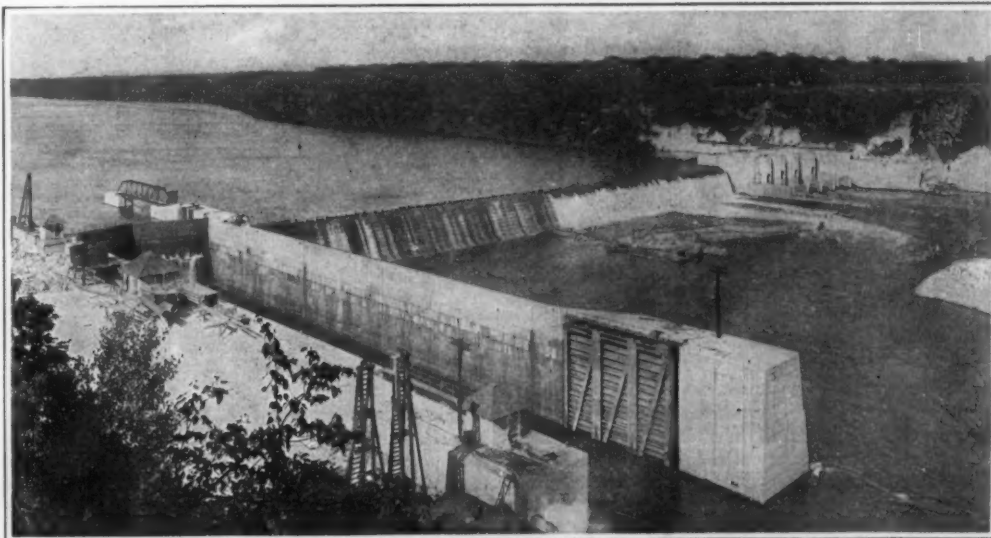
The New Mississippi

AN important improvement has recently been completed on the Mississippi. This is the high dam built by the Government between the cities of Minneapolis and St. Paul. It makes Minneapolis the head of navigation on the Mississippi River and a new municipal dock is being constructed by this city. The completion of the Government dam and locks comes just at the time that the Federal Government is trying to make inland navigation profitable. It is evident that Mr. McAdoo and his railroad administrative advisers have seen the value of the development of rivers for placing the country on a solid transportation basis; bids have been invited for 24 barges and six large towboats, and the United States Shipping Board has been asked to control and furnish tow boats and incidental marine equipment for use in commercial service on navigable streams.

All this argues well for the increased use of our rivers. Some of the Mississippi River towns are beginning to see the benefits that may accrue from the use of this stream and they are pushing plans which were under way before the Government took such an active interest in the question of inland waterway transportation. Chief among them is New Orleans which has been working in this direction for the past few years. This city as never before realizes her strategic importance as the gateway to the Mississippi Valley. There can be no question about her being the port for Latin-American trade, and now she calls herself the second largest port of the United States. The plans which have been brewing to make this port complete as regards terminals and docks have taken a rapid impetus



A new port—Minneapolis



The dam that makes the Mississippi navigable between Minneapolis and St. Paul

since we have entered the war. Rat-proof and nearly mosquito-proof and with a complete modern system of sewerage and good water, her dock and terminal facilities, when they are finished, will be of the best.

The construction of the large dam between Minneapolis and St. Paul is but another link in the chain of efforts to revive the use of the Mississippi. The dam and locks are located 4.86 miles below the municipal dock in Minneapolis, and 8.3 miles from the docks in St. Paul, which for many years have been the head terminus for traffic on the river. Though the project for building the new dam and locks was broached as far back as 25 years ago it was only recently that an appropriation was made. A smaller project was started and abandoned for the present efficient system. The cost has been borne by the Federal Government and the electricity generated will be utilized for the benefit of the public.

The construction of this dam was a remarkable engineering feat. High and rocky bluffs border the river and the bed of the stream is of sand, mixed gravel and limestone. The dam cost \$1,250,000 and is of the new hollow type, 578 feet across. It is made of steel and concrete and each of the series of chambers is about ten feet long. The lock, on the Minneapolis side, is 350 feet long and 80 feet wide. Two boats of the ordinary river pattern can lock through at the same time. The power for the operation of the steel gates, which weigh 70 tons each, comes from the St. Paul side of the river.

Among the first boats to use this new project for commercial purposes late last summer was a barge loaded with plows from Moline, Ill. The barge was rented from

(Concluded on page 577)

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

Americanization

OF our hundred and some odd million souls, fifteen millions are of foreign birth, and twenty millions more are of foreign or mixed parentage. Among these thirty-five millions of foreign stock, the foreign governments whose representation amounts to fifty thousand or more number eighteen; if we were to put the matter on a basis of language or nationality, the figure would be nearer thirty. The outstanding elements are eight million of German origin, five million Irish, two million from Austria and a million from Hungary, three million English and Scotch combined, two million Italians, and nearly three million Scandinavians.

Bearing in mind that new immigrants seldom fail to go where others of their race are to be found, this condition is obviously one under which it would be possible for the United States to revert to the state in which the dual monarchy of Austria-Hungary has for several decades found itself. Indeed, looking at the matter with judicial impartiality, that is precisely the natural outcome, the turn which events might reasonably be expected to take if left to run their own unhindered course. To those of us who are unwilling to see such a consummation, a pertinent question is accordingly what we have done, are doing and can do about it. Purely by accident, war has brought this question prominently to the fore; but ever since non-English-speaking immigration began to be heavy it has been a very live issue, though largely a concealed one.

An open minded introspection must make it clear that in our attitude toward these Americans of foreign stock we are prone to be very unreasonable. If one goes to board in a hotel in Rome, one does as the Romans do. But our immigrants are transplanted bodily, in whole families, with all their worldly goods; they have to make their homes here, knowing no word of our language. It seems obvious enough that until we give them the opportunity for a painless acquisition of our ways, they must retain their own ways—their language, their customs, their institutions, their ways of living. Yet when we see these ways and note how widely they differ from our own, we usually assume that "different" means "inferior"; and we are all too apt to put on the cloak of superiority and erect a barrier of contempt and intolerance. In far too many cases we seem willing, even eager, that the newcomers shall remain a segregated unit, a little piece of Italy or Poland or South Slavia transferred to this side of the water, with us but not of us, having no share in America and no communications with Americans save through the unkindly offices of the police court. And when this viewpoint governs, the position of the immigrant and his children is an impossible one; for submission brands them as an inferior race, while resistance to exclusion presents them in the light of upstarts and intruders.

But we are an impulsive folk, given to wide extremes; and sometimes we waken to the unfairness and even to the dangers of such treatment. Then we fly to the other end of the scale and try to Anglicize our south-European groups with a club. When we do this we simply reproduce on a small scale the conditions of repression and intolerance from which these people have fled, and which, under the ministrations of Franz Joseph and the Czars, have had no more notable effect than to intensify, in each little group concerned, the feeling of national identity.

Whether we attempt to ostracize those of foreign stock, or to tear from them by force all the associations of the land from which they spring, we accomplish one and the same result. In either event we merely make certain the perpetuation in our midst of a body of foreigners, with foreign ideas, foreign customs, foreign sympathies. How we can avoid this, how we can make the melting pot function, is the question. We have not space to answer it here save in the most glittering generality. But with the understanding that this is all we are attempting, we do not hesitate to say that the suc-

cessful solution is to be found only by making Americanism seem good to these people, and by helping them to attain it. They cannot be Americanized by force or by prohibition; they must be made to want Americanization, then allowed to have it and assisted toward its acquisition.

The carrying out of the program is beset with difficulties. It is necessary to substitute for the ward politician agencies which will take as much interest and extend as much aid as he does, but with a different motive and in a different way—a way which shall free the recipient from personal obligation, and make any feeling of indebtedness refer rather to America as a whole. The most obvious agencies—the home, the school, school, the library, the settlement house, the employer—must be used with the greatest discrimination lest they smack of patronage or coercion. In far too many cases they are even used with deliberate patronizing or coercive intent. It need not be emphasized that these attitudes will get us nowhere in dealing with the foreigners whom we wish to Americanize, or whom at least we ought to wish to Americanize.

We are led to write this very superficial statement of the problem which confronts America through her immigration by having seen it discussed with extraordinary thoroughness and adequacy. We cannot, in the narrow confines of this page, reproduce any parts of the excellent book in which we found this discussion, much as we should like to do so; but we can, and do, urge all our readers to buy, or at least to read, "Americanization," by Dr. Winthrop Talbot. We believe every reader will find it a most absorbing statement of the problem and the ways in which it has and has not, should and should not, be met. We believe that every one who reads it will be a better American for the reading, and that every community in which it is read will become a center of better Americanism.

Drafting Our Brains for Use in America

NOT long ago it became necessary for England to do some calibration work on a certain new type of ammunition. The work was delicate, dainty, difficult; it had to be done in a hurry. An emergency call was sent out for the best man in the Empire to handle it. It was reported that Private So-and-so was a genius in this field, that he had the necessary brains, equipment and experience, plus the inventive faculty to devise the apparatus necessary for doing the work well and doing it quickly. Inquiry developed that he was "Somewhere in France," in a trench. Orders were sent to bring him home, at once.

He came home—wrapped in a flag. He had been shot the day the order went out calling him home.

In our Agriculture Department are certain men of draft age who have been and are now doing important, difficult, highly specialized scientific work in regard to crops. A rider on a recent bill in Congress provided that no money from that appropriation be paid men in this Department who, because of their work, are in deferred draft classifications. Yet if just one of these scientific agriculturists discovers, let us say, a preventive or a cure or even a partial stay for wheat rust, he might easily by his single contribution do the work of fifteen thousand farmers.

The selective draft law operates in terms of arms, legs and torsos; it takes no account whatever of what is in a man's head. To be sure, the Government classifies the men. It endeavors to put an automobile mechanic in the motor truck section; it doesn't try to get a good cook to play in the band; it makes officers out of college men by choice. But all this is after it gets the drafted men in its clutches. Neither Government nor war machine has as yet more than dimly glimpsed the point that there is more use and need for certain types of men outside the army than in it.

Very recently it has been decided that there are such things as non-useful occupations, and that men of draft age must get out of these and into productive war work. The next step is to recognize that there are such things as absolutely vital occupations, and that men doing satisfactory work in these are beyond any draft on their bodies. We have made a beginning by permitting—nay, requiring—medical and engineering students to stick to their studies. We have properly closed the door to the slacker here by providing that when a man thus given deferred classification ceases to do satisfactory work in his courses, out he goes into the regular ranks. But this is a mere beginning; it does not cover the ground with any pretense of thoroughness.

The submarine problem is a case in point. More laboratories than can be listed on a page of this size started work in this field; and but an insignificant fraction of the workers in them could be classified as engineering students. There were a hundred schemes to be tested out and followed up. Suppose in one laboratory one man feels his careful way to a successful under-water submarine detector. Suppose that man goes to the Navy Department and asks:

"I will give you a device which will detect the presence of a submarine within a mile, without fail. Or I will

train and equip a thousand jackies for you. Which will you have?"

There could be but one answer. But the same Government that tells the Navy to "throttle the submarine in its lair" goes into the laboratories of the land and takes thence the young men whose ideas and inventive faculties might shorten the war—takes them to make soldiers out of them, soldiers to shoot and be shot at! It deliberately confines the work of originating new devices to the men over thirty-one; and then, likely as not, it takes these same men out of the laboratories in their turn to do work of some other sort.

Let it be understood that this is no case of attaching blame to any one man or group of men. It is the result of our entirely American independence, our determination to paddle our own canoe in our own way, to learn by our own mistakes and not by anyone's else. Food, fuel, ships—we have had muddles in all of them, because we had to start the job in our own peace-basis way, and learn by experience that it could only be done in the war-basis way. And we have done the same thing with our draft and our army. Only—we don't have to keep on doing it wrong after we find out.

It is not argued that every college student who takes a laboratory course should be draft-exempt. It is not maintained that every young man who wears a rubber apron and calls himself a bacteriologist or a chemist or a physicist should be eliminated from military service. But any university teacher of science can testify that the type of brain that can do original scientific work is too rare to be wasted, once it is found. A thousand men can read, experiment, remember—and stop; the thousand and first does all this, assembles his knowledge of a subject, and from it as a platform projects his mind into the unknown seas, bringing back with him a new thought, a new conception. Such are the men who produced the flying machine, the submarine, the wireless. Such are the men in embryo whom the war machine takes for trench work; takes blithely, without thought that it is wronging its own cause.

Before America got into the big game abroad, a high German official spoke substantially in these words: "The war will be over long before America can mobilize her man power or her resources. What we of Germany really fear from America is not these, it is an intellectual arousing. Americans are inventive; we are not. We can improve, refine, get the best there is from an idea; but America produces the idea. An intellectual awakening in America's laboratories might spell a disaster for Germany which all America's men and resources could not encompass."

We believe that our men and resources are going to make some impression upon Germany before long; but that is not the question. If our intellectual awakening can accomplish as much as our physical and material power, let us put no obstacles in the path of that awakening. But let us not forget that there is going to be an "after the war." If all our young men who are capable of adding to the stock of knowledge are allowed to follow their purely human and patriotic desires and become tiny cogs in the vast war machine, who will take their places and function, not as small cogs, but as whole wheels in the progressing vehicle of civilization?

Unquestionably such a man will make a good private, a better sergeant, the best kind of an officer. But if the compliments that come back to us from France are not all camouflage, we are peculiarly rich in young men who will make good soldiers. Out of ten thousand such capable, enthusiastic, patriotic, able fighters, a select few are the sort of men able to take hold of a tough problem like detecting the submarine. Finding the cause of trench fever, or discovering the antidote for a new gas, and to follow that problem through to a solution. Could we not then much better spare this select few to the laboratory, and in their place take an equal number, equally anxious to go, equally qualified for a soldier's work, and utterly unfit for the work of the scientist?

No call, be it of the draft or of patriotism, but has found the young man in the college, the laboratory, the experiment station, eager to go. But he ought to be made to stay. He should be drafted, like the medical and engineering student, and told that his work lies in the high task of keeping up his research. For that is the only way to hold him; draft him, and make him stay. Otherwise those of draft age go automatically, and those a bit younger or a bit older go because they want to go.

If Germany fears our intellectual awakening, let us intellectually awaken! If we have brains, let us use them. If in our laboratories, our investigation rooms, our experiment stations, lie the answers to a thousand problems of the war and the after-the-war, shall we refuse to keep on the job the men who are capable of prosecuting these labors?

The answer is in education, in talk, in discussion, in propaganda, in legislation. Write your Congressman; talk in your club; think. Make yourself an agent of this propaganda. Let us send a million, five million—twenty million, if need be—to France to fight; but let us not handicap our soldiers by stripping our laboratories of the men who can give them the things they need with which to win the war.

Frederick Converse Beach

BEFORE the present issue reaches the readers of the SCIENTIFIC AMERICAN, many of them will have learned, through the daily press, of the death of Mr. Frederick Converse Beach, Secretary of Munn and Company, Inc., publishers of the SCIENTIFIC AMERICAN. With his death there passes another member of a family which was early identified with the beginnings of modern journalism, and later and more particularly with that phase of it which comes under the category of the scientific and technical.

For a name which is treasured and honored in the Beach family is that of Moses Y. Beach, the grandfather of the deceased, one of the prominent figures in the life of old New York, who was for many years the proprietor of the *New York Sun*. In his day as in later years it was considered that a desk in the *Sun* office meant a training in the best school of American journalism; and it was in the logical sequence of events that the proprietor should in due course place his son, Alfred Ely Beach on the staff of the *Sun*.

Soon thereafter, young Alfred Ely learned that a publication known as the SCIENTIFIC AMERICAN was for sale. This was a new venture, which had been less than a year before the public; but, in spite of its small beginning, Mr. Beach saw the inherent promise of such a technical American journal, and suggested the purchase of the paper to a young friend and former schoolfellow, Mr. Orson D. Munn. A partnership was formed by the two young men, and the SCIENTIFIC AMERICAN, which had been founded on August 28th, 1845, by Rufus Porter, made its first appearance with Munn and Company as proprietors and Rufus Porter as Editor, on July 23d, 1846.

Mr. Frederick Converse Beach was the son of Alfred Ely Beach. He was born March 27th, 1848, on Columbia Heights, Brooklyn, but moved early in his life to Stratford, Conn., which continued to be his place of residence to the day of his death. His early education was received at Bridgeport, Conn., and in 1865 he entered Yale University, graduating in 1868 from the Sheffield Scientific School, with the degree of Ph.B.

It was about this time that Mr. Beach's father was interesting himself in the question of underground rapid transit for the City of New York, of which he was a strong advocate. That he had the courage of his convictions is shown by the fact that, entirely at his own expense, he built a section of passenger subway beneath Broadway between Warren and Murray streets, which was operated by compressed air, a medium which the great engineer Brunel had used in another form for the propelling of trains. Mr. F. C. Beach was placed in charge of this work, first as constructing and then as operating engineer. This stretch of full-size subway was opened in February, 1870.

On the completion of this work, young Beach joined the staff of Munn and Company in the branch office at Washington, D. C., and subsequently he became engaged in the patent business in New York. Upon the death of his father in 1896, he added to his other duties those of Secretary of Munn and Company, a position which he held up to the time of his death on June 8th, 1918.

The devotion of Mr. Beach to business was a matter of frequent comment among his friends and associates; and with the possible exception of his work in the promotion of amateur photography, there was nothing of a business character in his long career that lay so near his heart or gave him such sincere pride as the growth and popularity of the SCIENTIFIC AMERICAN.

His activities in the world of photography began in 1864, when he was in his seventeenth year, and continued until his death. He was one of the first amateurs of any note in America. He founded the New York Society of Amateur Photographers (now the Camera Club) in 1880; and in 1889, with Miss Catherine Weed Barnes, he started *The American Amateur Photographer*, of which for many years he was the Editor. The venture was a success, and after absorbing several less known publications, it appeared under its present title of *Amateur Photographer*. Mr. Beach's chief interest was in the Lantern Slide Interchange, of which he was manager, and in which he offered several prizes for competition. Through the Interchange various camera clubs through-

out the country sent selected slides to Mr. Beach, and a committee met regularly in New York for the purpose of selecting 100 of the best slides, which were distributed to the various camera clubs for exhibition. It should be mentioned that for many years Mr. Beach was active in promoting the Postal Progress League, of which he was President. The League was largely instrumental in securing the establishment by Congress of the parcel post.

Mr. Beach was possessed of sterling qualities that won for him the respect and affection, not only of a wide circle of friends but also of his associates in the offices of the SCIENTIFIC AMERICAN. He was kindly, sympathetic and approachable. He was married in 1875 to Margaret A. Gilbert of Stratford, Conn., and leaves two children, Stanley Y. Beach, who married Helen B. Curtis, and Ethel H. Beach, who was married to James A. Wales.

The Shoe-Machinery Decision

THE Supreme Court has given the Shoe-Machinery trust a "clean bill" so far as the Sherman Law is concerned. This corporation was formed in 1899 by the amalgamation of several companies engaged in the manufacture, sale and lease of shoe machinery,

what is a combination in restraint of trade and just what sort of a contract or agreement is forbidden.

It would seem to be the inherent right of any person, natural or corporate, to buy out as many competitors as he can, or to combine under his management several independent concerns, whether competing or not; but in the Oil and Tobacco cases this was held to be violation of the law. In the Shoe-Machinery case, however, there seems to have been evidence to show that the original aggregation was constituted of non-competing companies, and that those acquired subsequently were either non-competing, or in an embryonic stage, or that their acquisition was dictated by the settlement of litigation arising over the infringement, by them, of the United's patents.

We are inclined to believe that this decision is to be directly attributed to the control which this company had over its machinery by virtue of patents, and by its manner of furnishing its machinery to those desiring its use. We have long contended that under our patent laws the owner of a patented machine, if he does not sell it, can absolutely dictate and control the terms upon which he is willing to permit its use; that, as long as he retains title to the patented machine, he can make it a

condition of the right to use it that the lessee shall pay either directly in rents or royalties, or indirectly as by providing that all materials necessary for use in the leased machine be acquired from the lessor.

Indeed, we believe it would be of no moment whether the machine were patented or not. It would seem that one who sought to lease a certain article must agree to the terms and conditions upon which the owner may be willing to let him have it.

If, as a matter of fact, the machinery of one of the independent companies infringed the patents of the United Company, under our patent laws these machines could not have been furnished to shoe manufacturers without the consent of the United Company. It would follow that if the United had not acquired the other company, the public would have been deprived of the use of those machines. No matter how much of an improvement they may have been over similar machines of the United, the manufacturer could not have done business at all. In a sense, therefore, it did not constitute a competing company; if it was going through the motions of competition by furnishing its infringing machines, it was doing so in violation of the law and of the rights of the United Company. The Court therefore, very properly held that in acquiring this infringing company, which possessed certain patents of its own, for perhaps improved machine, though subordinate to prior patents of the United Company, the latter concern was conferring a benefit upon the shoe manufacturer.

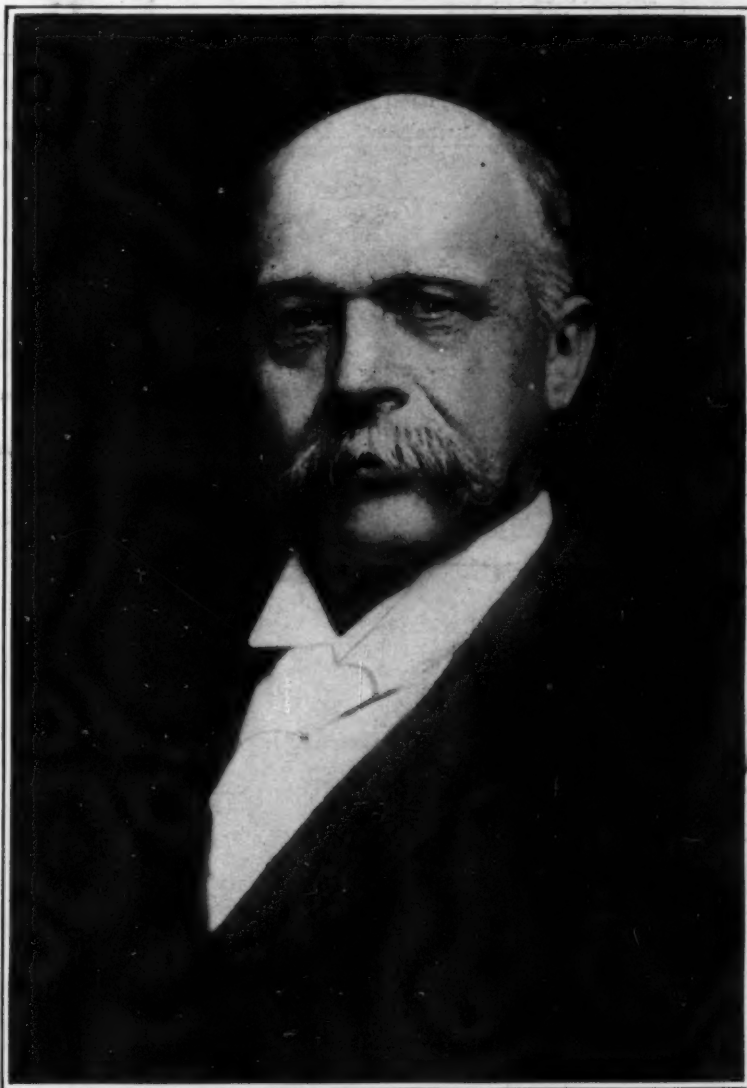
It has been nowhere seriously contended that the owner of a patented article should permit competition by another concern manufacturing an infringing device; in fact, our courts are daily enforcing patent rights and checking infringing competition.

The Court was also undoubtedly influenced by the evidence showing the absolute necessity of the machinery of the United Company in the modern shoe

factory, and the service which it renders, on the same terms, to every user of its machines, regardless of whether he makes a hundred or ten thousand pairs of shoes per day.

A New Source of Sugar

MUCH was said a few years ago about the development in the Philippines of the industry of making sugar from the nipa palm. Mr. O. W. Barrett, formerly of the Philippine Bureau of Agriculture, states that in 1914 the Bureau worked out a process by which it is possible to produce a fairly light-colored sugar, which crystallizes readily, from the kaong, or sugar palm (*Arenga saccharifera*), which has been used for centuries in the Far East. The difficulty in making high-grade sugar from the *Arenga* lay in the large amount of organic impurities in the sap. Mr. Barrett, who recently lectured on this subject before the Biological Society of Washington, stated that without any expense for cultivation the sugar palm yields a better crop year after year, for at least twenty years, than does the sugar cane, and vast areas of it occur in the islands.



Frederick Converse Beach

and more particularly of what is known as bottoming machinery—that is, machinery for uniting the uppers and the soles. The decision states that this original organization and the subsequent acquisition of other shoe-machinery concerns do not constitute violation of the Sherman Anti-Trust Law, and that the leases under which the company furnishes its machinery to shoe manufacturers are not contracts in restraint of trade.

Like all decisions of a divided court, this one, while conclusive so far as the issues of the particular case are concerned, is not at all illuminating of the statute, nor of material assistance as a precedent, save that it seems to settle for all time the right of a lessor, as distinguished from a vendor, to control absolutely the conditions under which his leased property shall be used. In addition to recognizing this right, the Court appears to have come to the conclusion which we reached long ago: that the Sherman Law, while directed to the correction of the abuses which in many instances have arisen from the monopolizing of business by large aggregations of capital, is at the same time so indefinite that it is impossible for any one, even those learned in the law, to decide just

Bone and Sinew for Our Aircraft

Winning the World War in the Forests of Oregon and Washington

By Horace E. Thomas

THIS is the story of spruce. It is the account of an inspiring off-stage act in the drama of world war, with its setting in the mighty forests of the Pacific Northwest. There, devoid of the glamor and thrill of the battlefield, thousands of soldiers, loggers and millmen are struggling to make the production of spruce timber adequate for the needs of the United States and her Allies. Their success will be no less a factor in the final issue than the tactics of the battlefield, and their campaign is being prosecuted with foresight, skill and energy.

No chapter of the war outside the actual battle zone is more enthralling than this one. Spruce has become a magic word. Of this wood are our winged fighters built—beams, struts, braces, all the wooden parts except the propeller blades, and even for these spruce is sometimes used, alone or in combination. So production of spruce timber in desired quantities is an enterprise to which the Signal Corps is addressing itself with a thoroughness that is bound to spell success.

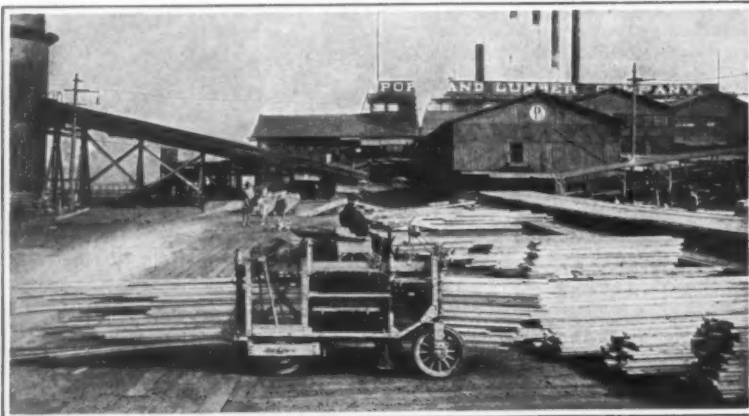
That there is any shortage of spruce may be surprising. Most of us have thought of this wood as a commonplace one, realizing that spruce forests cover vast areas. But there are many varieties, of which Sitka spruce alone is acceptable for airplane manufacture. And while white spruce, black spruce, Engelmann spruce, or some other member of the family may be found in many localities, Sitka spruce is a stranger to every part of this hemisphere except a narrow ribbon along the coastline, beginning in northern California and continuing through Oregon, Washington and the islands and mainland of British Columbia into Alaska. In this 1,300-mile strip there are few facilities for lumbering save along the coast of Oregon and Washington. It is to these states that the United States and her Allies are looking for 95 per cent of their airplane stock. It's a big order; but Uncle Sam has tackled the problem in a big way.

"Airplanes will win the war" is but another way of saying that spruce will win the war. Sitka spruce, the only variety here discussed, has been found the ideal. It has all the necessary qualities, particularly the prime requisites of strength and lightness. There are lighter woods, there are stronger woods; but the combination of lightness and strength is possessed by spruce alone. Other materials that have been tried, including metal rods and bamboo, have all failed in some important particular. Italy is even now experimenting with Douglas fir, doubtless as an expedient forced by the difficulty of getting the spruce; but fir is heavier. Port Orford cedar, which grows in southern Oregon and northern California, has been found acceptable, but the supply is small. Spruce is 10 per cent better, in resilience and lightness, than any other wood; and it is just this 10 per cent that will give us victory.

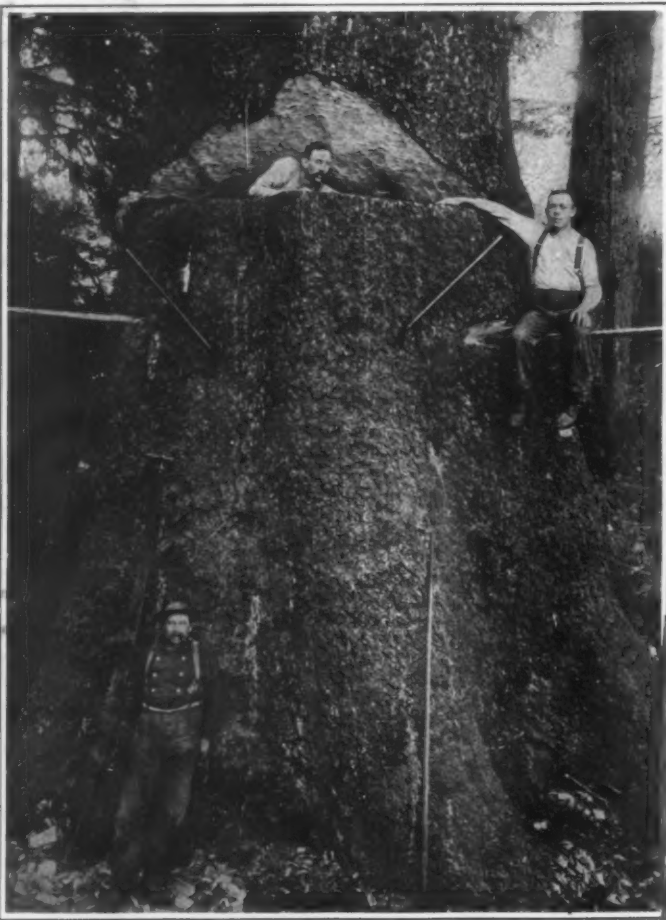
The production of spruce boards for airplanes is the most exacting business that our lumbermen face. Every piece must be perfect. The grain must be true and must not run out; there must be no knots, pitch pockets, or other faults. In producing any other material a certain amount of inferior stock is ex-

pected as a matter of course. But there must be no seconds in airplane lumber; the slightest blemish may spell disaster.

The spruce tree is a forest giant. With massive base



The sort of mill at which our airplane timbers are prepared



Only in our Pacific Northwest are such spruce trees as this to be found

up to 12 feet in diameter, the bigger trees send their pointed tops to a height of 160 or 180 feet, standing sturdy and straight for 80 feet to where the first branches reach out with their foliage of yellow green. The finest

trees are selected for aircraft lumber. From the lower slopes of the Coast Range and the Olympics, where they have stood guard for five or even eight hundred years, they are felled and hauled to the mills. When possible the logs are cut into timbers upward of 40 feet long, at least six inches wide, and two inches thick. This is ideal aircraft lumber; but many pieces may be discarded for imperfections for every one that is accepted.

These large pieces are used for beams; the smaller cuts are fashioned into wing beams, braces and struts. It is comparatively easy to find clear spruce for the pursuit planes, slender falcons of the air with wing spread of 20 feet or thereabouts. It is far more difficult to cut unblemished timbers for a heavier machine like the Caproni, with a wing spread of 100 feet or more. Fortunately there are few defects in spruce that do not show on the surface—another quality that commends this wood to the birdman.

The wastage in airplane stock is very heavy. It has been found impracticable to size the parts at the mills, and when the timbers reach the factory much must be thrown away. The builders now use approximately 800 feet of lumber in preparing the 167 feet actually included in the average biplane. Wasteful as this may seem, it is a vast improvement over recent best performances, under which 2,440 feet went for a single plane, but the engineers hope to reduce the figure to 600 feet. Laminated construction, masterpiece of the joiner's art, has resulted in considerable saving. Small pieces are more likely to be without defects than are large, and these, by scientific splicing, are built into beams as strong as one solid timber. No nails are used in joining these boards, or in putting together the frame of the airplane; for nail holes would weaken where every particle of strength must be conserved.

Fully awake to the importance of an adequate spruce supply, the Government has organized an industrial army to expedite production. The War Department last fall created the Spruce Production Division of the United States Signal Corps and placed at its head Col. Brice P. Disque, with headquarters in Portland, the heart of the spruce district. When he began work in November there were 3,000 men in the spruce camps of Oregon and Washington. Colonel Disque immediately set about to increase this force to 10,000. He now has substantially the full quota. Workmen already in the woods and others who could be hired have been supplemented by enlisted men from the Signal Corps. This employment of the military in a war industry, though optional with the men so assigned, is a radical departure from the usual policy and indicates, perhaps better than anything else, the Government's determination to have every foot of spruce it needs for our air fleets.

The head of the Spruce Production Division has not adopted a dictatorial attitude toward his men. He is appealing to them to speed up production as a duty to their country. Owners and workmen alike have been organized into a patriotic order called the Loyal Legion of Loggers and Lumber-

(Concluded on page 577)



Airplane spruce on the way to the sawmill



Sawing airplane timbers from the log

A Laboratory on Wheels

WHILE protected from permanent loss through delivery of bad rails by the steel companies, a railroad may suffer serious temporary embarrassment from the necessity for rejecting and returning a considerable part of a rush order which does not come up to the mark. One road has met this situation quite successfully by taking the whole onus of testing the rails off the rail-maker and placing this responsibility upon its own shoulders. A traveling testing plant has been installed by placing all the necessary equipment in a standard passenger coach, and this runs about the lines from place to place, dropping in upon the various rail-makers and testing their raw materials and finished product on the spot. The testing plant comprises a very complete chemical outfit, as well as standard apparatus for physical tests of metals. This rolling laboratory really protects the steel company quite as much as it does the railroad, by insuring the former against using up its valuable labor on rails that will be rejected by the buyer.

Machine Tools of Concrete

Monster Creations of Steel and Stone to Help Crush the Kaiser

By Robert H. Moulton

WHILE the entire country has been clamoring for quicker action in furnishing munitions for war purposes, Chicagoans have been quietly solving the problem of how to produce the maximum number of big guns and shells in the shortest possible time. As a result, Chicago has become an active center for the manufacture of machinery designed to smash Von Hindenburg's defenses.

The first of the newly invented machines is a planer of record breaking size. The second is a machine for boring big guns of any size or length. The planer was designed especially for producing the boring machines and is a radical departure from anything hitherto attempted in the machine-tool line, but the possibilities suggested by its construction are numerous in this as well as in other fields. The planer is built of concrete and iron and is the first machine of its kind that has ever been built of that combination. It is also the biggest planing machine in the world.

These machines are so unusual in construction, and can be built with such speed, that the methods of manufacture are attracting wide attention. Machinery for war purposes formerly was made so slowly that it would be impossible to supply it with the present demand for quick construction. An attempt to build the big planer of iron, according to regulation methods, would have meant a delay of at least two years. By the new method they can be turned out ready for use in two or three months. The new machines are the invention of Lucien I. Yeomans.

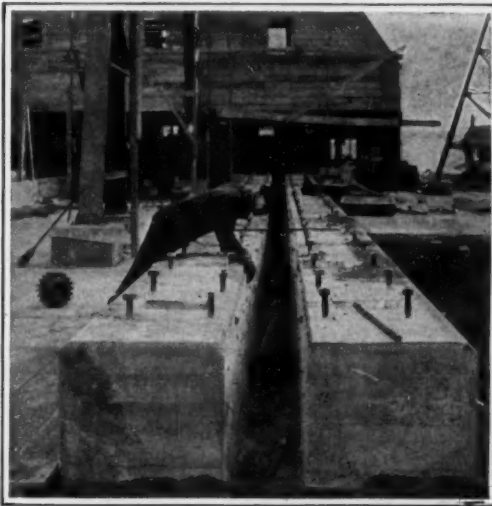
The original construction plan for the planers provided for a battery of four machines, each with a bed 184 feet long and 17 feet wide at its greatest width. Two of the machines are now completed and in use and two others are in various stages of construction. Each planer weighs about 2,500,000 pounds and contains approximately 212,000 pounds of iron and steel casings and 13,500 cubic feet of concrete reinforced with 34,000 pounds of steel bars. The bed of the planer was designed like a huge concrete girder intended to support a load, which accounts for the high percentage of steel reinforcement. This was done to avoid any possibility that the



A metallurgical laboratory on wheels

bed might settle at any point and destroy the alignment of the ways. On the bed of the planer there is a sliding platen, which moves in iron grooves. The platen weighs 69 tons and upon it is placed the work that is to be planed, two heavy traveling cranes being used for the latter purpose.

The power for running each planer is furnished by two 40 horse-power, three-phase, 60-cycle motors running at 1,800 r.p.m. One motor drives the table forward at a speed of approximately 20 feet a minute while the other gives a rapid return of approximately 40 feet a minute.



Concrete bed of a planer about to receive the metal top-works

The method of feeding the cutting tools might be termed "human feed," and is perhaps as unusual as the planers themselves. No automatic means of feeding is supplied, each cutter head being controlled independently in both horizontal and vertical direction by a man stationed on top of the housings. Four 24-inch handwheels are conveniently located for the operator at this place, and the shaft carrying each handwheel also carries an index finger which, in conjunction with a graduated dial, forms the means of gaging the rate of feed.

The boring machines which are being made on the planers can handle a cannon 38 feet long with

a caliber of 14 or 16 inches, close to the limit of heavy ordnance. In addition to this use these machines are to be employed for boring the shafting needed by destroyers. This shafting is hollow, as that form gives the greatest possible strength for a given weight, and will soon be needed in immense quantities for the fleets of destroyers convoying merchantmen and chasing submarines.

The Current Supplement

AFTER the war will come a commercial contest in the readjustment of the business of the world that will be fully as far reaching in its results, if not even more so, than those effected by the armies now fighting in Europe, for in it will be engaged practically every commercial nation in the world, all arrayed to a greater or less extent against one another. In this contest, which promises to be an extreme struggle of merchants, means of communication with distant markets will be of the

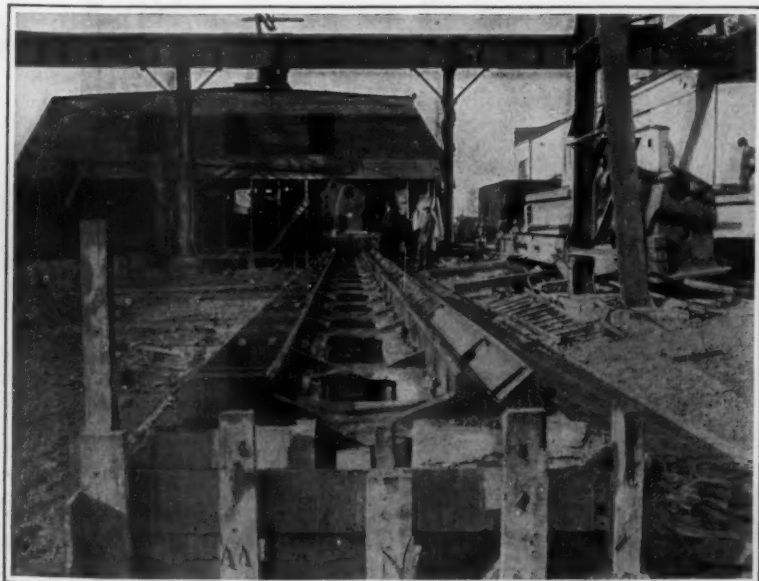
utmost importance. An article in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2216, for June 22d, on *Ocean Cables and Wireless* tells what a dominating position the possession of these instrumentalities give to the nation that is best equipped. *The Depths of the Pacific* gives some idea of the mysteries of a vast region full of wonders of which comparatively little is known at present, and which will be an attractive field for scientific investigation for years to come. A chart and illustrations add to the interest of the article. The paper on *Ordnance on the Allied Front* is concluded in this issue. Wool is absolutely essential for clothing for our soldiers and sailors, and the immense quantities required for this purpose, at a time when sheep raising has been diminishing, is resulting in a serious shortage. This matter is dealt with in an illustrated article entitled, *The Wool Product Diminishing*. *Notes on the Protection of Eyesight* presents much information on a subject of constantly increasing importance. *Cannel Coal in the United States* tells of the origin, composition and uses of a material in regard to which comparatively little information is available. Other articles in this issue include *The Earth and Population*; *Salt Water Aquaria in the Home*; *Boiler Corrosion*; *Air Pumps and Condensers in Steam Engineering* and *Synchronous Signalling at Sea*.

Testing Concrete Ship at Sea

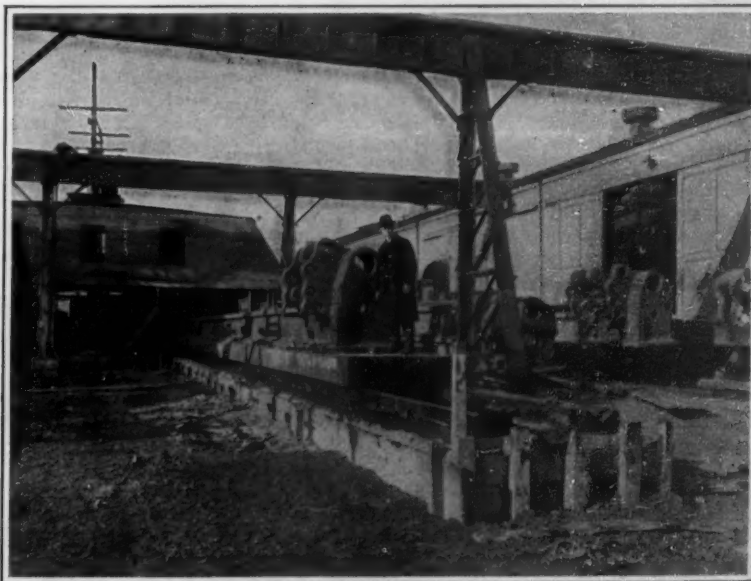
EXHAUSTIVE tests of the concrete ship "Faith" under actual seagoing conditions have been ordered by R. J. Wig, chief engineer of the department of concrete-ship construction of the Shipping Board. It was announced at the Shipping Board, several weeks ago, that a committee of experts would leave for California, to accompany the "Faith" on her trial trip. The committee consists of F. R. McMillin and H. S. Loeffler, engineers, and L. Brush, naval architect.

Self-recording instruments of new design will be used to determine the nature and effect of strain on the steel reinforcements and the results of wave pressure. The tests are expected to provide ample data necessary for expediting the designs now under preparation for the Government's fleet of concrete tankers.

A report by Chief Engineer Wig on the development of concrete-ship construction abroad lists the following British and French programs already in advanced stages of production: England, 140 barges of 1,000 tons each and 24 tugboats; France, 700 barges of 1,000 tons each and 50 tugboats.



Concrete-bed planer, showing sliding platen of steel



A gun boring machine that runs on a concrete base

Strategic Moves of the War, June 12th, 1918

By Our Military Expert

THE third great drive of what may be called the battle for Paris began on May 27th by a rush of the Germans on the Aisne front which, when compared with the second or Flanders drive in April, makes the latter simply a side show or an introduction. The drive around Ypres in April was soon stopped; though made on a 20-mile front a gain of only 10 miles was obtained and the salient driven into the British-French lines in the valley of the Lys could never be widened. But now on the Aisne front the results show a bulge made by the Germans 40 miles wide, and 20 miles deep. This salient would give every facility for continuing on a great scale the war of movement if the Germans could muster enough reserves to obtain an advance from their present positions. There is but little doubt that a great crisis in the present war has come and that the fate of the Allies or the Germans may be told in a short time. It would certainly appear from our present knowledge that the Austro-German alliance is at the height of its military powers; but if striking military gains are not obtained in a few days, that alliance must gradually lose strength and must finally be defeated. The Austro-German successes that have followed one another for two months past have no doubt surprised the Teutons as much as they have the Entente Allies; but it does not seem possible that these can continue if they are to be gained at such a cost in men and material.

Now that a comparative lull has taken place in the drive on the Aisne front, it may not be out of place at this time to review some of the details of the kaleidoscopic operations leading up to the existing military situation in that sector of hostilities.

The ridge known as the Chemin des Dames to the south of Laon that had been finally taken by the French last summer after months of fighting, was deemed so strong it was not believed that the Germans would carry out against it any main drive. It was held by seven French and British divisions who had the task also of defending the 25-mile line from Soissons to Rheims. It is now evident, however, that men and guns moving at night had been quietly gathered together by the Germans in and around Laon, thirty-five or forty divisions, about four hundred and fifty thousand men, having already been identified as taking part in the advance. On the Ypres front as well as on the lines from Arras to Montdidier heavy artillery fire was kept up, Amiens was bombarded at long range and Givenchy near La Bassée was made the center of an artillery and infantry assault. This was all camouflage and was done with a view of attracting the French reserves to the north.

Meanwhile, the concentration of German troops was being carried out at Cambrai, St. Quentin and Laon. A strong force was brought together before the Chemin des Dames; and at midnight on Sunday the 26th of May hundreds of German guns and trench mortars began a furious bombardment of the hills held by the seven divisions of the Entente Allies. After a two-hours fierce shelling, an assault was made by 30 divisions or approximately by four times the number of defenders; this assault ended in an advance that has turned out to be one of the greatest since trench digging has become the order of the day. Although many hints of a probable drive in this vicinity had been given, it appears, as before stated, that no serious attempt at a break here was expected by the French; it must be acknowledged that a surprise certainly seems to have been the case for the French and British were absolutely overwhelmed, losing many prisoners, guns, stores and the Soissons-Rheims railroad. The French commander moved up reinforcements as rapidly as possible, but the Germans, no doubt equally surprised at the advantage gained, pushed forward fresh troops into the bend of the Allied lines.

Nothing could be done to hold the enemy and the Entente Allies were forced to retreat night and day, although reserves were constantly being rushed to the front.

Soissons was captured and the Germans crossed the Vesle River on the second day, May 28th. By this time, the German wedge had developed into a bulge and, by the slow process of trickling or infiltration, hostile parties spread to each side. On their right flank the enemy advanced rapidly, but on their left, in the vicinity of Rheims, little progress was made. On Thursday, May 30th, a strong attack was carried out north of Soissons towards Noyon and thus gradually the battle

lines were extended over a distance of more than eighty miles, with an attacking force of at least four hundred thousand men supported by reserves. With such an advance on the new front, more rapid progress could be made; and on the 30th the first German troops reached the Marne.

The fifth day found the Germans fighting on a 40-mile front from Soissons to Chateau Thierry through Vierzy and Neuilly-St. Front.

In five days the Germans had advanced 30 miles, had crossed the Aisne, the Vesle, and the Ourcq, had cut three railroads and had taken thousands of prisoners, guns and war material. They were within 44 miles of Paris and were only 18 miles short of the nearest point reached in the advance in 1914.

But Foch had been bringing up his reserves and he was slowly approaching the point where he could meet his opponent on a more equal footing. The latter had made his pace too rapid and had outrun in many places his artillery and supplies, although he possessed the advantage of interior communications. But so far no serious effort to cross the Marne has been made nor does that seem to be the enemy's intention at the present time. His movements since reaching Chateau Thierry have been to extend his lines to the west so as to connect in the shortest manner possible with the Montdidier-Noyon front. This has made his present object plain, though originally it is thought he had no definite plan except to break through the Entente Allies lines. That final object now is undoubtedly Paris, though the capture of the city would be a long and bloody process. The battle is for the moment at a standstill on the Marne,

west. It was therefore to be expected that German reserves would be employed to extend the front to the Montdidier-Noyon sector or to open a new attack in one of the sectors north of Amiens.

It was now clear that the French Commander-in-Chief had outgeneralled the Germans on this front by having brought them to a standstill without impairing the strength of his defenses of the Channel ports. Ground was yielded yet without loss of points of strategic value; but the Germans were forced either to try to draw away the supports in the Picardy and Flanders fronts or they must face the full strength of the British, French, and American troops now opposing them on the Soissons-Chateau Thierry-Rheims salient. The French commander had before him two needs of prime importance, to economize his man power so that when the time came the offensive could be taken with a sure prospect of victory, and also to bar the road effectually to a vital German objective. These objects were attained; and, if the third great offensive had come to a close, it was clear that, despite the confessed ability of the German leaders, the French commanders had beaten them for the third time since the great drives began in March last, when their own strength in men and guns was at its maximum. The present status on the Marne can be summed up as follows: the Allied front has been bent, not broken; all roads to Paris have been blocked here; Rheims has not been taken and the road to Chalons which the Germans hoped to gain possession of has been closed; the plateaus and heights between the Oise and the Aisne, the Ourcq and the Marne have been strongly fortified and held; the Marne and the roads to

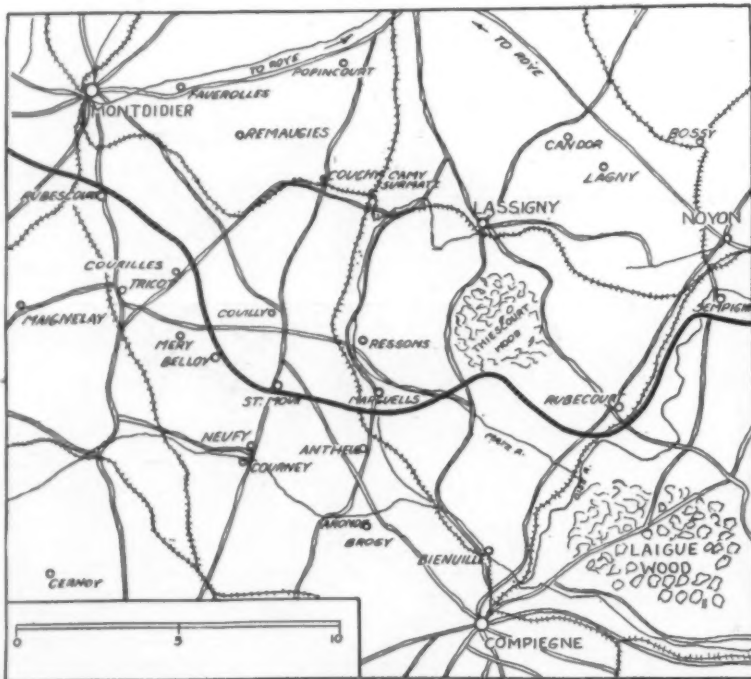
Paris were all covered; at least fifty of the German reserve divisions had been drawn into the battle and the losses had been heavy in the extreme.

The front from Montdidier through Noyon to Soissons was the next natural scene for a German drive since it would not only give additional room for widening their present salients near Montdidier and at Chateau Thierry but it would also permit of an advance down the valleys of the Oise and the Ourcq toward Paris. And it was here south of Lassigny as a center and on a front of 20 miles that the Germans launched a fourth great attack on Sunday, June 9th and, at the present writing, the battle is still raging furiously; the fighting is described as the most desperate and bloody of the entire war. As far as can be ascertained now, about twenty German divisions were in the first line of attack and were supported by a large number from the reserve. It is apparently necessary for the Germans to maintain an advance for, in such a campaign as the present one, not to go forward spells defeat for them and as a consequence losses cannot be considered. So far the Germans have succeeded during three days fighting in carrying forward their line a distance of six and even eight miles. One of the primary objects is to reduce the salients at Montdidier and on the Marne; for if successful, the retirement of the French

forces between the Aisne and the Marne would be forced; they would open the roads to Paris from Chateau Thierry, Villers-Catteret and Compiègne. The new attack is directed particularly at Compiègne because it is a great railroad center with railways branching out to the north, east, south and west. With the town in the possession of the Germans, not only are the valley of the Oise and the main railroad to Paris in their hands, but the roads and canals connecting Péronne, St. Quentin, Laon and Soissons would give them a complete system of supply and of troop movement. Without Rheims on the one hand and Compiègne on the other, there are many long detours to be made by their reserves and supplies for various parts of the lines. How far the French can hold back the present assaults remains to be seen; but the French commander's strategy will probably continue as heretofore; he will seek to avoid any counter-offensive of large dimensions as long as the Germans have great reserves capable of striking. It is still necessary for him to hold an equality of reserves against the time when the Germans must play their final stakes or when his own peril becomes so great that he must attack—as Joffre did at the Marne when the French had reached their last line for defending their eastern front—Verdun, Rheims, and Paris.

The German people are now demanding the long promised victory and the German commanders must make haste. This campaign is undoubtedly turning

(Concluded on page 579)



Scene of the fourth German drive, June 1918

although local fighting continues day by day. The reserves brought up by the French have been sufficient to hold the enemy in his present lines; and the first and most dangerous phase of the movement at this point has passed.

The moves at present that the Germans can make on this portion of the front are down the valley of the Marne toward La Ferté Sous Jouarre or down the valley of the Ourcq by La Ferté Milon. But they have already used up many divisions so that enormous drains upon their reserves have been made. Reports, however, give them 350,000 fresh troops available for a new drive which may come at any time. At present there has certainly been perceptible diminution in the violence of these attacks though heavy fighting has occurred daily at various points.

No action of more than local significance on this front has been reported; a marked pause has extended over what a few days ago was an active battle line. This possibly has meant one or all of the following on the Marne front: the Germans have exhausted themselves by their efforts to advance which, taken all in all, have so far proved of no serious advantage to them; the Allied air superiority and attacks against their troops and communications have made it impossible for them to move forward men, materials, and provisions to make up for losses incurred; but above all another drive was contemplated. They were firmly held on the western flank of their bulge and also by strong Allied lines to the north-

Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

Concerning Gas for Fuel

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of March 16th appears an article by A. C. Laut entitled "Concerning Fuel," which, because it deals with a very important subject, will no doubt be widely read. It is just because I am much interested in bringing about the very practices advocated that I am impelled to criticize rather vigorously the glaring misstatements which comprise the greater part of this article. These misstatements are so obviously the result of carelessness in obtaining information and recklessness in disseminating it that their publication can only discredit the cause which the author seeks to advance.

The literary children which spring from the impregnation of the popular-magazine-writer mind with scientific data are usually more or less malformed, but the article in question is notable for the fact that it hardly contains a sound organ in its body nor possesses a single normal limb. It suffers from general hyperbolic hypertrophy.

For instance, in advocating the use of gas to save railroad accommodations, the author neglects the fact that the coal and oil used to manufacture artificial gas must also be transported largely by rail. If we assume the thermodynamic efficiency of the coal-burning furnace to be 30 per cent, that of the gas-burning furnace to be 60 per cent, and that of the gas manufacturing process to be again 60 per cent, it will be seen that the use of gas for house heating involves the transportation of nearly as much coal as does the use of coal-burning furnaces. This assumes, of course, that the coke produced as a by-product of gas making will be burned as efficiently as the gas itself, which is rather too optimistic. But even if we cut the saving in transportation space no more than from 16½ per cent to 15 per cent on this account, do you think that the public would willingly pay the increase of 100 to 300 per cent in house-heating costs which would be involved by the change?

Then, too, the narrative of how Henry L. Doherty knocked 'em out o' their seats in London is the sort of thing I am quite certain Mr. Doherty would himself disprove most strongly. It was general practice in Europe years before Mr. Doherty's visit to extract benzol and toluol from gases whenever and wherever the market prices warranted the expense of extraction; and benzol and toluol were quoted in the usual market reports in the same fashion as corn and pork. Mr. Doherty presented no new theory to his British friends; the entire discussion revolved around the question of whether the further extraction of benzol at the then current price would pay. If the English gas companies extracted benzol and toluol from their gas before serving it, their customers would expect a reduction in price corresponding to the reduction in heating value. Out of the price obtained for the benzol and toluol, ranging at that time from 15 to 20 cents per gallon, the companies would have to reimburse the consumer for this decreased heating value and pay for the extraction of the benzol and toluol. With all the facts before them they concluded it would not pay, that the greatest possible reduction in gas costs which could be thus effected would be less than one cent per thousand feet. The statement that the "London scientists" (or, to be correct, the British Gas Managers and Engineers) were moved to oppose Mr. Doherty's recommendation because it involved departure from the ancient and time-honored candle-power standard is pure piffle. The facts are that the average candle-power of British gases was, even at that time, far below that maintained by Mr. Doherty's most important company in Denver.

We may not assume that just because the candle-power standard is of no significance in the most advanced state of the art, there are no weighty reasons for retaining it in a measure. In the homes depending upon gaslight, open flame tips which require gas of relatively high candle-power still furnish about half the total illumination. There are hundreds of thousands of gas consumers who cannot afford the initial cost of the more economical mantle lamps in more than one or two rooms, it in any. Of course gas-lamp manufacturers are bending every effort toward the development of less expensive good lamps which will enable the present user of open flames to replace them with mantle burners, but in the interim the consumer has the right to expect some sort of protection.

The author's contention that the elimination of the

candle-power standard would permit artificial gas to be sold at substantially the same price as natural gas is entirely outside the facts. To equal natural gas at 40 cents the artificial product would have to sell at 27 cents, since the natural gas contains about 50 per cent more heat units per cubic foot than the other; but at present the average price of artificial gas throughout the United States is about 90 cents. Some companies which can obtain cheaply large quantities of by-product coke-oven gas have been able to furnish this for house heating at a very low figure; but of course this affords no legitimate basis for comparison. The most competent gas engineers, who have long appreciated the importance of furnishing the best gas at the lowest price, are of opinion that elimination of the candle-power standards results in saving only a few cents per thousand feet, an economy of insufficient magnitude, in fact, even to serve as the basis of a change in price to the consumer. Further, house heating is a seasonal business; and if the gas companies are to undertake it, there will be involved a heavy investment in plant that would lie idle during 60 per cent of the year. I need not point out that coal can be mined and transported in anticipation of the winter's demands, eliminating this factor, while gas manufacture cannot be so treated.

"Conservationists sometimes worry about the oil supply for the world's navies and merchant fleets. The fuel engineer smiles. He knows that the waste products of gas, the very ingredients that have to be scrubbed out of it, would run every battleship and motor car in the world."

The alleged fuel engineer who knows all this knows a lot of things that aren't so. I fancy his smile will turn into a sickly grin when he goes to the trouble of figuring up gasoline consumption and benzol supply, and finds out that if all the benzol were removed from all the gas made in the United States in a year, it would run American motor cars alone for less than two weeks. For battleships, a fuel costing 60 cents or even 25 cents per

How the U-Boat Is Being Defeated

THE accompanying diagram, showing a year's decline in shipping losses due to U-boat piracy, is based upon one which was issued by the British Admiralty with the last monthly returns of losses of British, Allied and neutral merchant tonnage "due to enemy action and marine risk." The diagram covers the year from April, 1917, when the ruthless U-boat warfare started, to April, 1918. The statement for April of this year shows that the losses reached a total of 305,102 gross tons, of which 220,709 tons were British and 84,393 tons were Allied and neutral ships. These April figures show a decrease of 94,371 tons compared with the preceding month of March, and a decrease of 588,775 tons compared with April, 1917, when the German U-boats struck their heaviest blow. It will be noted that the average fall in the rate of sinkings was rapid at first and later was not so marked; although it is still proceeding. It should be noted, moreover, that the reduction in losses has been far more rapid for Allied and neutral ships than it has for British.

Of great interest in connection with this diagram is the recent announcement by the Secretary of the Ministry of Shipping of the total tonnage of steamships of 500 gross tons and over that have entered and cleared ports of the United Kingdom, from and to ports overseas. For the present year the total in gross tons for January was 6,336,663; for February it was 6,326,965; for March, 7,295,620 tons, and for April, 7,040,309 tons. It should be noted in connection with these figures that they embrace all United Kingdom sea-borne traffic other than coastwise and across channel.

Chemistry by Wholesale

IN January contracts were signed for the building of a super-factory near Nashville, Tenn., for the manufacture of smokeless powder. This agreement contemplated a daily output of 500,000 pounds of smokeless powder; the first unit of the plant was to have been in operation by October 1st, followed by four identical units at intervals of six weeks.

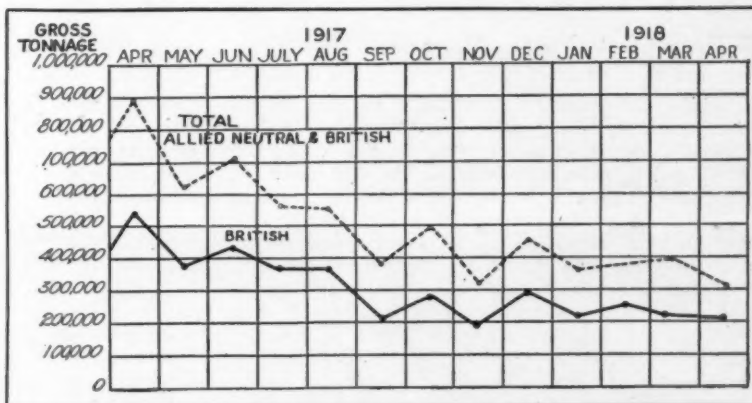
From time to time this contract has been revised, in accordance with the developments of the powder situation or the discovery that greater freedom of action for the contractors would be advantageous. Nine units, with an aggregate daily output of 900,000 pounds, are the present plan; the date on which the first of these is to go into operation has been set forward twice, until it now stands as July 1st; the interval between the completion of the additional units has been cut to 25 days. In spite of the very intensive schedule thus indicated, the sulfuric acid plant went into commission on June 1st, some ten days ahead of the date on which production of this intermediate would have had to begin in order to turn out the first powder on July 1st.

The Old Hickory plant, as this gigantic establishment has been christened, is what is known as a self-sustaining plant, combining all the features of the ordinary gun-cotton and smokeless powder factories. There are complete units for the manufacture of every ingredient that goes into either of these explosives, together with facilities for meeting some of the demands of the Government powder plant at Charleston, W. Va. Each of the nine sections is practically complete within itself, isolated from the others for safety in the event of accident, and approximately eight times the size of the largest smokeless powder plant in this country prior to the war. The entire establishment is accordingly some seventy times the size of the largest factory of its kind which we had in 1914.

It was of course necessary to build a town for the employees; and though some 12,000 of the workers will live in Nashville and go back and forth each day, the population of the new community will be about 20,000. For those living in Nashville a special railroad has been constructed leading to the plant.

Some idea of the scale of operations, may be had from the statement that 4,500 tons of coal will be consumed per day, together with a hundred million gallons of water—enough for a city of a million inhabitants. Of this water, 65 per cent is used in chemical processes for which it must be treated and filtered. The bare idea of 65,000,000 gallons of reactions per day is quite sufficient to make the laboratory chemist gasp, and should give him a clear understanding of why it is that the manufacturer cannot always do, on a factory scale, the things which the investigator can accomplish with comparative ease in a test-tube.

In addition to the railroad which is built into the plant, it has been necessary to reconstruct the highways leading from Nashville; and within the plant itself many miles of standard and narrow gage track will be operated. The finished plant will, in fact, contain about 33 miles of the former and 46 miles of the latter.



The slow strangulation of the U-boat campaign in its first year

gallon, is simply out of the question. Besides, the notion that benzol, etc., have to be scrubbed out of the gas is pure moonshine. Gas containing these ingredients has been served for a century and more.

The statement that the "old line gas companies" do not want present standards disturbed because they are sure of satisfactory dividends with gas at 80 cents or a dollar will be regarded by most gas men as sheer impudence, particularly at a time when these very companies are passing dividends because of insufficient earnings. As a matter of fact, all the agitation for a revision of gas-service standards in conformity with the requirements of modern practice has emanated from and been directed by these so-called old line companies.

Finally, may I suggest that the next time this author ventures into a technical field, she refrain from assuming that present wartime prices represent the normal and stable conditions? Her article shows clearly that she supposes the war prices of 60 cents per gallon for benzol and \$2 for toluol to be the regular thing, whereas the facts are that 20 cents per gallon for each is a rather liberal allowance to make in calculating the returns on an operation that must be carried on after the return of business normality.

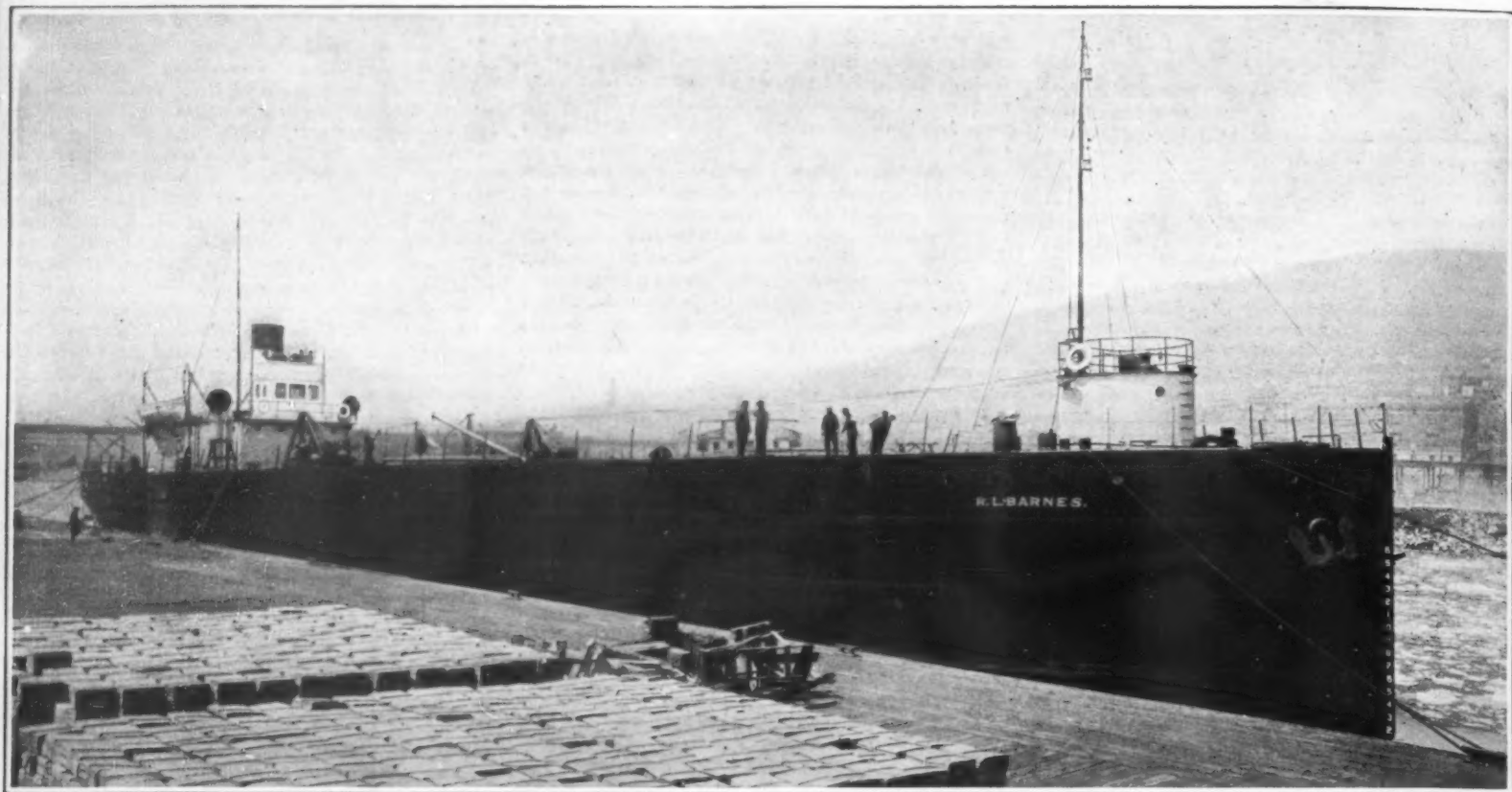
There are many reasons why certain changes in gas standards are desirable and many reasons why these desirable changes have not been effected; but none of them have been touched upon by your contributor. What is true in the article is ancient history, and what is not old is either false, or irrelevant, irresponsible and incompetent.

ROBERT FRENCH PIERCE.

Gloucester, N. J.

Dr. Woodrow Wilson

DR. WOODROW WILSON, whose address is stated to be The White House, Washington, D. C., is mentioned in the report of a recent meeting of the Washington Academy of Sciences as having been elected to honorary membership in that body, in recognition of his contributions to economic and political history.



The sea-going canal boat, "R. L. Barnes." Length 258 ft., breadth 43 ft., depth 24 ft.

A Sea-Going Canal Boat

From the Lakes to Atlantic Ports by the New York State Barge Canal

MANY of us will remember the advent of the "whale-back" at about the period of the Chicago Exposition, and some of us at that time must have traveled on the "Christopher Columbus," a huge, 20-knot, whale-back passenger ship, which had a capacity of 5,000 people.

The unusual and very original sea-going canal boat shown in our illustrations was built by Captain McDougal of Duluth, the originator of the whaleback type of ship. In view of the approaching completion of the Erie Canal, it occurred to Captain McDougal that great economies in transportation would be effected, if a type of vessel were designed which would be capable of making continuous lake and ocean voyages, in the course of which, by certain quickly-made adjustments, she could be stripped for the passage from the Lakes to the Atlantic and vice versa, by way of the State Barge Canal. The economic advantages of being able to ship a cargo of freight from Duluth to Atlantic ports or across the ocean to Europe need no elaboration.

If the builder is correct in his calculations, the solution of this problem is found in the freighter "R. L. Barnes," which forms the subject of our illustrations. The limitations of size are of course those of the canal locks, which are 320 feet long, 45 feet wide and can accommodate vessels of 12 feet draft. The "R. L. Barnes" is 258½ feet long by 43 feet beam and 24 feet deep from top deck to keel.

In the design of the vessel, it was sought to secure three principal results: First, a ship of maximum cargo-carrying capacity on moderate dimensions; secondly, a vessel which could utilize standard steel shapes in its construction, and that would require a minimum amount of shop work at the shipyard; and thirdly, so to construct the upper works, smokestacks, masts, etc., so that these could quickly be removed and placed in the hold; and the vessel, as thus stripped, be capable of clearing the bridges and overhead structures of the State Barge Canal.

The most striking and novel feature about the "R. L. Barnes" is the strictly

rectangular cross-section of the ship and the absence of any fairing away of the lines toward the bow and stern, which are strictly wedge-shaped. The flat floor extends from stem to stern, and the cross sections of the vessel, even at a few feet from the stem show an absolutely rectangular form, with parallel sides.

The builder claims that this type of construction is not only very cheap and conducive to rapid erection, but that it gives a maximum amount of cargo capacity, and also provides a vessel that is unusually seaworthy.

It will be noted that the "R. L. Barnes" has no bilge keels; the effect of these being secured by the square bilges. Furthermore, the deck, which is slightly crowned is perfectly straight from stem to stern, and there are no bulwarks.

The designer, who is an old steamship captain with long experience on the Lakes, in speaking of seaworthiness said: "I have had opportunity to study the behavior of very large flat-bottomed, flat decked, square-shaped dumping mud scows, while they were being towed in rough weather. When the towing steamer is pitching and rolling heavily, the mud scow, which is loaded to

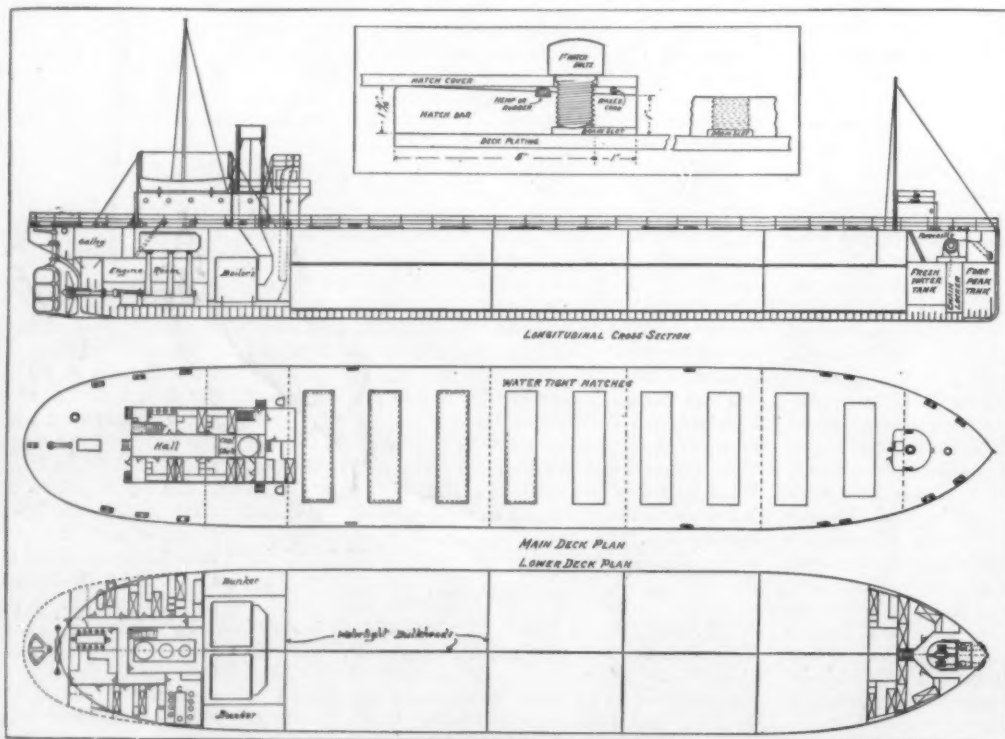
within a few inches of its flat deck, is not rolling and pitching, and it is astonishing how very little water come aboard. The scow is comparatively still until her cargo is dumped through her bottom; when she immediately commences rolling and pitching." The original idea of the whaleback was based upon these observations and led to the construction of the "R. L. Barnes" and her type.

With a view to reducing the depth of the ship to facilitate its passing under bridges on the canal, the depth of the double bottom is kept as low as practicable and longitudinal strength is assured by the provision of a central longitudinal bulwark. Additional longitudinal strength is afforded by the system of hatches, the covers of which consists of a single flat plate which, when in place, lies flush with the deck and is bolted down by closely-spaced one-inch hatch bolts, watertightness being secured by hemp or rubber gaskets.

The captain of the ship assures us that her seagoing qualities are most excellent. She was caught in a recent very heavy northeasterly gale off the Long Island coast, and when other ships within sight were making heavy weather of it this vessel was remarkably steady, the seas making a clean sweep across her deck and little water remaining aboard. The deck houses forward and aft are built in bolted-up sections and are heavily bolted to framing that forms part of the deck structure. Here, of course, is a structural feature to which particular attention should be paid to insure that these connections are sufficiently heavy to stand up against the full impact of Atlantic seas.

The dimensions of the "R. L. Barnes" are: Length, 258½ feet; beam, 43 feet; depth, 24 feet.

As showing the cheapness and simplicity of construction, Mr. McDougal writes us that the "R. L. Barnes" was built without the use of bending rolls or furnace. The only furnace was a fire in a blacksmith shop to heat a few plates for the stern of the ship. The erection was done by a couple of electric derricks which hoisted the frames and plates into place. After the ship was built, the



Inboard profile, deck and hold plans of the "R. L. Barnes"

two traveling derricks, which are mounted on wheels, were hoisted on board and are now utilized for loading and unloading the ship. Their width is such that they travel down each side of the ship on the space between the ends of the hatch covers and the outside railing of the ship. As they move from hatch to hatch they are made fast to heavy eyebolts in the deck. The current is furnished to them through cables leading from a generator in the engine room.

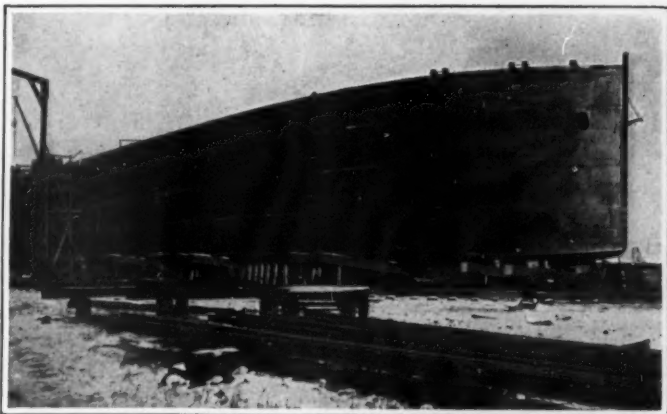
The "R. L. Barnes" is an example of utility carried to the utmost limit; and one misses, of course, the graceful sheer and the faired-out lines of the standard type of ship; but after all, this vessel is merely the logical and ultimate development of the typical Great Lakes freighter with its moderate sheer, its long line of hatches, and its deck houses concentrated at the extreme ends of the ship. In this age of insistent and enormous demand for ships, the "R. L. Barnes" certainly offers attractive features in her cheap first cost, great rapidity of erection, and large cargo-carrying capacity. She probably will find it easier to breast the gales of the Great Lakes and the Atlantic than to make headway against the currents of incredulity and the heavy seas of human conservatism and hostility to the thing that is novel.

The "Panzerkraftwagen": A German Version of the Tank

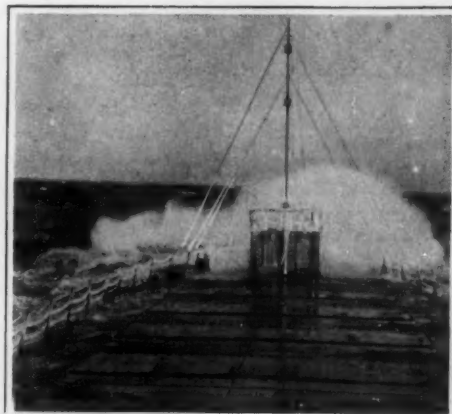
THE much heralded "Panzerkraftwagen," or German tank, made its debut in fair numbers in the great attack of March 21st last. One of these tanks slipped into a stone quarry and turned over on its side, and a subsequent advance by French troops placed this German machine well within Allied lines where it could be studied at leisure.

The German version of the tank is a ponderous affair, quite in keeping with the "kolossal" tendencies of the Teutons. It weighs 45 tons, and carries a crew of 18. In general appearance it follows the French rather than the English design of tank, but is far larger than anything yet attempted by the Allies with the exception of the American steam-driven tanks which, at this writing, have not yet been in action.

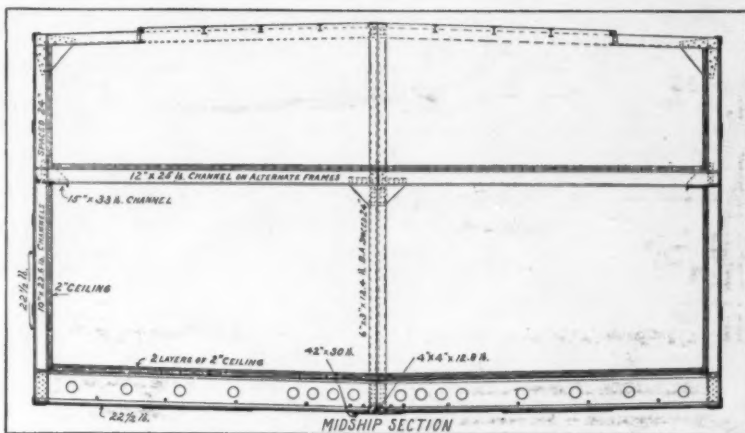
Following the practice of the French and British tank crews, the Germans have named each of the Panzerkraftwägen. In the case of the captured tank it bears the name "Elfriede," and carries on all sides the characteristic Maltese cross of the German air service. Its armor varies from 1.2 inches for the front plates to .64 inch on the sides and .8 inch at the rear. The steel employed must be applied in



On the ways; note wedge-shaped bow and flat bottom



Driving into a heavy sea



Midship section; note square bilges and central bulkhead

considerable thickness because of the evident lack of steel in Germany, and that in turn makes for a cumbersome, if not inefficient, tank.

As for armament, one 47 mm. or 1.85-inch rapid-fire cannon is mounted for direct fire ahead, and six machine guns mounted in pairs are placed at the sides and the rear. The 18 men of the crew have none too much room in this 23-foot tank, and the conditions during actual

combat are certainly not unlike the proverbial sardines in a box. The conning tower, in which the driver sits, is entered from above and has hinged side-shutters; but it is reported that observations even at moderate range, is difficult owing to structural defects. The crew can get in or out of the steel box by means of two doors on either side. Every inch of space within the tank is utilized to the utmost; in fact, folding chairs are mounted on the inside of the doors and ropes are hanging from the ceiling in order to provide "straps" for the crew after the fashion of a crowded street car.

All in all, the Panzerkraftwagen, aside from an inclosed gear box which reduces the possibility of the gears getting clogged with mud and dirt, presents no great improvement over French and British tanks which have fallen into the hands of the Germans. If anything, it is merely more cumbersome through lack of proper materials, and therefore a poorer fighter.

Face Camouflage for the Night Raider

IT is not in the massed attacks upon trenches and the pitched battles in the open that the real adventure is to be found in the present war. The most thrilling tales come from the small parties of men who go forth at nightfall into No Man's Land, bent on the destruction of enemy positions, the capture of guns and other trophies, and, withal, prisoners. For the motive nine-tenths of the time is to secure information on enemy activities. Great risks are taken, but the information gained may mean the saving of many hundreds of lives and the winning of a battle or campaign. Everything depends upon secrecy in night raiding.

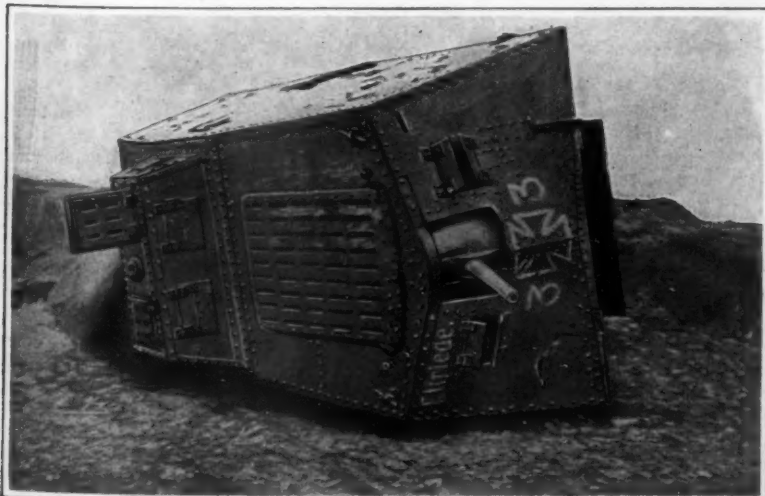
The slightest noise, such as the clashing of a steel helmet against barbed-wire entanglements or a cough or grunt, may bring a volley of rifle and machine-gun fire upon the raiders with disastrous results to them. It also follows that the face and hands must be blackened, in order that they will not betray the raider in moonlight or even starlight.

With a well prepared plan, the night raiders go about their business with great precision and dispatch, for much depends upon speed in such work. Often enemy patrols are encountered in the blackness of No Man's Land, and the ensuing battle must be fought with bayonet, trench knife and fists; for neither side can fire for fear of killing its own men and drawing fire from the enemy trenches. Indeed, it requires the strongest morale to engage in a combat of this kind, knowing that it is a question of cold steel and man-to-man, with the imminent danger of machine guns and rifles on either side opening up in force at any moment.



Copyright, Underwood and Underwood

Rear view of the German tank, showing the coil of cable carried on the roof



Front view of the German tank with its rapid-firing cannon, showing conning tower for driver



Under side of the Panzerkraftwagen, giving some idea of the arrangement of the caterpillar belts

World Markets for American Manufactures

Conducted by WILLIAM W. SNIFFIN

A department devoted to the extension of American trade in foreign lands

American Markets for Cement

THE export of cement from the United States to its neighbors in South and Central America and the West Indies is an industry which, in the aggregate, is of no small proportions. The war has thrown the trade of those countries largely into our hands, while, at the same time, cutting off our exports to practically all other countries. In many localities in these countries the use of cement is comparatively new, but its utility and its adaptability to local conditions have been demonstrated, so that imports should increase as freight accommodations permit. Rock suitable for the local production of cement is not to be found in many of the countries to the south of the United States and their needs must be met, therefore, with imports.

Curacao, the Dutch island possession in the Leeward group off the coast of Venezuela, imported cement in 1915 to the value of \$3,693, which in 1916 increased to \$11,586. Though little construction work is being done there, still the imports of cement have come solely from the United States and increased considerably when a large petroleum refinery was recently erected. Since then cement has been used for buildings, foundations, dams, etc., and the director of public works has used it successfully in the construction of streets.

Bermuda has imported fairly large amounts of cement in recent years. The imports from the United States advanced from 3,638 barrels valued at \$5,120 in 1915 to 6,612 barrels valued at \$9,840 in 1916. At the same time, imports from the mother country, Great Britain, increased from 375 barrels with a value of \$2,312 in 1915 to 1,575 barrels valued at \$2,866 in 1916. The municipal governments of the Bermuda Islands, as well as the British Admiralty and the Board of Public Works, are constant purchasers of this material.

The French possession, Martinique, another of the Leeward Islands, is at present importing nearly all of its supplies of cement from the United States. Prior to the war the Government always secured its supplies from France as far as possible, but all government work has been stopped until after the war. Imports amounted to 1,700 metric tons in 1916, of which the United States supplied 1,550 tons.

Exports of cement from the United States to Porto Rico (which in trade is largely regarded as a foreign market) amounted to 228,473 barrels, valued at \$253,821, in the 12 months ending December, 1915; 257,019 barrels, valued at \$331,402, in 1916; and 242,703 barrels, valued at \$470,419, in 1917. Many handsome concrete residence and public buildings are being erected on the island. Consolidated schools of eight rooms or more, constructed of concrete and embodying the most up-to-date principles of school construction, are supplanting the wooden structures so much in evidence formerly but now confined largely to out-of-the-way places.

American exports of cement to all markets amounted to 2,586,350 barrels valued at \$5,329,588 in 1917. This is only 22,374 barrels more than in 1916 and 21,319 barrels more than in 1915, but the value represents an increase of 39 per cent over the 1916 figures and 58 per cent over those for 1915. The principal markets of the United States during the past three years have been Cuba, Brazil, Panama, Mexico and Peru, all in the Western Hemisphere; a situation which is, of course, largely produced by war conditions. The countries named took two-thirds of the total exports of cement from the United States in 1917.

It is true, of course, that the demand for cement in Europe, both to repair devastated regions and also to supply the needs for space occasioned by the lapse of construction work during the war will be enormous and will afford wonderful trade opportunities to the United States after the restoration of peace. But a profitable market for cement exists close at hand, with our neighbors

to the south and our proximity and ability to meet their needs will make those countries turn to us for their supplies.

Germany Planning for After-War Trade

REPORTS of concerted efforts by the Germans to regain their lost foreign trade come to us from time to time and show that the plans for reestablishing their trade connections after the war are being pushed vigorously. The need for American manufacturers and exporters to emulate their example becomes apparent when the care and magnitude of their plans are con-

sidered. committees representing the various trades importing raw materials and exporting finished manufactured products. Thus cotton firms established at Bremen a company to act as one of these advisory bodies for the purchase of raw cotton in Russia, Roumania and the adjacent countries. Membership in this company is limited to firms which in the three years preceding the war annually imported at least 10,000 bales of cotton for their own use or, as accredited representatives in Germany of foreign firms, negotiated the sale for import to Germany of at least 20,000 bales annually.

Even more recently a similar organization was founded at Hamburg, though whether it is merely a branch of the company at Bremen or an independent rival is not certain. The purpose of the organization is building, operation of railroads and street railways, construction of irrigation, harbor and electric plants, as well as factories of every description, exploitation of plantations, ore fields, etc., formation of subsidiary companies and participation in them and granting credits. The authorized capital of the organization is 25,000,000 marks, and the following firms are among those represented on the board of directors: Nord Deutsche Bank, Dresdner Bank, Hamburg-American Line, Warburg & Co., Hugo Stinnes, Ltd., Rhenish Westphalian Coal Syndicate, Krupp's Gruson Werk, Friedrich Krupp, German South Sea Islands Trading and Planting Co., and Siemens & Schukert.

The firm of Stinnes appears to be one of the most important individual firms in this Hamburg organization and seems likely to develop into a most colossal enterprise after the war. It is mainly concerned with ores, but has extended its ramifications to almost all branches of trade that ultimately serve its main business, and has established almost complete independence. It owns its own inland water-transport and controls other canal shipping companies under other names. Before the war the concern had 18 seagoing vessels of medium tonnage, while under construction it had 11 other steamers with a total tonnage of 125,000. It is thus independent of post-war freight rates. Recently a company was formed at Hamburg to operate the Stinnes company's fleet, not only for the special purposes of the parent company, but also for trade in raw materials of all kinds, particularly all products of mines and foundries, agriculture and of the chemical and electrical industries, most especially in relation to foreign trade in them.

Firms engaged in the export of identical products are organized, as far as possible, for the purpose of preventing ruinous competition, combining transport facilities and propaganda, etc. Binding agreements are, however, being made only slowly and reluctantly. However, firms in Germany are planning to do their best, at the outset, to secure neutral representation, especially through Holland, in those countries where the economic provisions of the Paris conference will be carried out most vigorously, and also in parts of South America. Especial efforts are to be made, in this manner, to retrieve the lost trade in automobiles, motor tractors, agricultural machinery, etc. These efforts should not be ignored by the Allied countries, it must not be considered that they do not constitute a real menace. Some German firms have been able, despite all the disasters that have befallen the foreign trade of their country as a whole, to maintain or even increase their influence overseas. Notable among these is the Rhenish Iron and Steel Combination, which, through its associated or controlled company, Bocker & Co., according to a Dutch report, has since 1915 acquired possession of the greater part of the wolfram mines in South America and is now exploiting them through its agency in Buenos Aires, of course, with a view to the subsequent needs of the parent country.

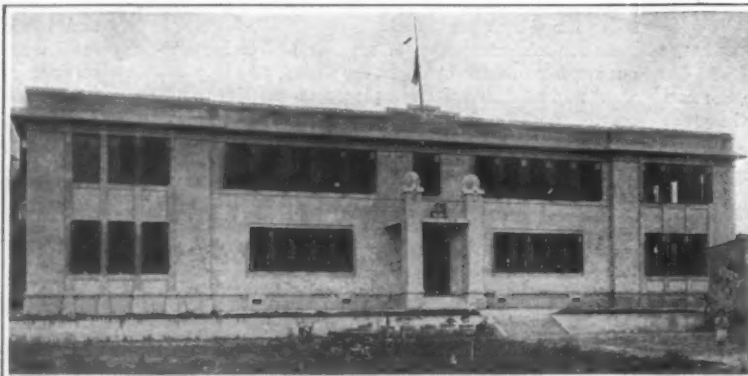
The extent of the pre-war porcelain manufacturing

(Concluded on page 579)



Copyright, Brown & Dawson

An old line schoolhouse in Porto Rico



Copyright, Newman, Brown & Dawson

Recent Porto Rican school of American cement



Copyright, Newman, Brown & Dawson

Cuba draws upon us in building this residence street

sidered. The passage of the Webb-Pomerene bill places an effective weapon in our hands for meeting this trade offensive. At the same time, American exporters should take cognizance of the fact that similar legislation has recently been passed in Great Britain and France, though, doubtless, the continuance of the effective cooperation now existing between these governments and ours will be extended long after the war, especially in foreign trade.

One of the latest moves in Germany is the establishment of the Europäische Handelsgesellschaft (European Commercial Co.), with headquarters at Bremen. This organization consists of numerous associated advisory

Gauntlets and Gaiters that Defy Barbed Wire

ONE of the cruellest weapons in this war is barbed wire. Hundreds of thousands of soldiers have paid with their lives in the encounter with that weapon of defense; and there is ample pictorial evidence of how storming troops, caught in the maze of barbed wire defending certain positions, have been mercilessly mowed down by the defenders. We have seen photographs of splendid Russian troops "hanged" on German barbed wire defenses—troops which, were it not for the wire entanglements, would have made short work of German infantrymen at close quarters. But until now barbed wire has prevailed against all forms of attack except severe artillery preparation—and even then.

A successful attempt to rob barbed wire of its terrors and potency appears to have been made by George Lynch, a traveler and war correspondent of London, England. Mr. Lynch has invented a certain padded cloth which, it is claimed, is proof against the sharp points of barbed wire. In fact, with a pair of gauntlets made of this cloth, it is possible to handle barbed wire without the slightest fear of the spikes penetrating the material and scratching the hands. A convincing test of the peculiar properties of Mr. Lynch's cloth is shown in one of the accompanying illustrations, where the wearer of a pair of special leggings is resting on a board studded with sharp nails, without sustaining the slightest injury.

Aside from gauntlets and gaiters, the new impenetrable cloth can be used for a number of other purposes. For instance, the cloth can be made up into vests, which, aside from affording protection against barbed wire, also insure the wearer against shrapnel splinters. Sleeping bags of the new material are also being used by soldiers, protecting them from the elements in the usual way, with the additional advantage of being a protection against shell splinters and barbed wire. The sleeping bags when tied together can be thrown across an obstacle so as to afford safe passage to attacking troops. It is claimed that a blanket of the new material will bear the weight of a man's body without permitting the spikes to penetrate the material.

A 2-inch thickness of the special cloth will resist a Webley-Fosbery bullet fired at a distance of 25 yards. Indeed, such bullets as are not held up by the cloth are only permitted to pass with a certain amount of anti-septic wool, and the surgical value of this feature is at once apparent.

All in all, Mr. Lynch has done much to solve the barbed-wire problem, judging from the extensive use of his cloth by most of the Allied armies.

When Ladies Learn the Art of Railroad

IT is a sign of the times that the railroads are coming to employ women more and more in many different branches of railroading. At first, women were only to be found in the lighter forms of work, such as telegraph operating, and in light repairing and cleaning work; but confronted with a long period of war and with an increasing scarcity of men, railroads are now anxious to train women for almost all kinds



These gauntlets, made of special fabric, are proof against barbed wire



Even sharp nails cannot penetrate these special gaiters bearing a man's weight

of work. Since 1907 the Pennsylvania Railroad School of Telegraphy has been engaged in training young men for telegraph and telephone work. To facilitate the work during war times, however, the school was recently transferred from Bedford, Pa., to Philadelphia, and the courses have been opened to girls and women, as well as men. The school, which is now in charge of Thomas Saddington, furnishes practical instruction in railroad

general work, including accounting, way-billing and on. Upon graduation, a student is thoroughly conversant in some of the most important branches of modern railroading.

A Submarine for Raising Ships

SOME three years ago there appeared in these columns a story and photographs of a proposed spherical car for deep-sea salvage work. At that time the inventor, Mr. William D. Eisson of Los Angeles, Cal., had not as yet put his idea into practice except to the extent of building a small machine. But the idea, novel as it was, appealed to the scientific world. Again the subject is brought to the fore, this time because the inventor has constructed a large machine which is now ready for actual work.

Briefly, Mr. Eisson's machine is a deep-sea spherical submarine with a steel shell several inches in thickness to resist tremendous pressures. It is provided with two propellers and a rudder, permitting of such travel as is possible with a craft connected by chains and cables to a tender riding on the surface. The tender supplies the submarine with electric current for driving all the machinery and for furnishing illumination both inside and out. Telephones are provided for intercommunication between tender and submarine.

The submarine, which is equipped with many external devices including four powerful electromagnets and a drill, operates in about this manner: When the scene of the wreck is reached, the submarine car is lowered at the approximate spot so that it can explore about until the wreck is definitely located. Then the submarine ascends only to return with a corrugated steel pontoon, which is equipped with an electrically-driven pump. The pontoon, which is provided with a long steel cable, is filled with water so as to sink all the more readily.

In the case of steel hulls the submarine can fasten on to the plates by means of its electromagnets. Then an electrically-driven drill mounted in the center of the group of electromagnets, is brought into action, boring a large hole in the hull of the sunken ship. With

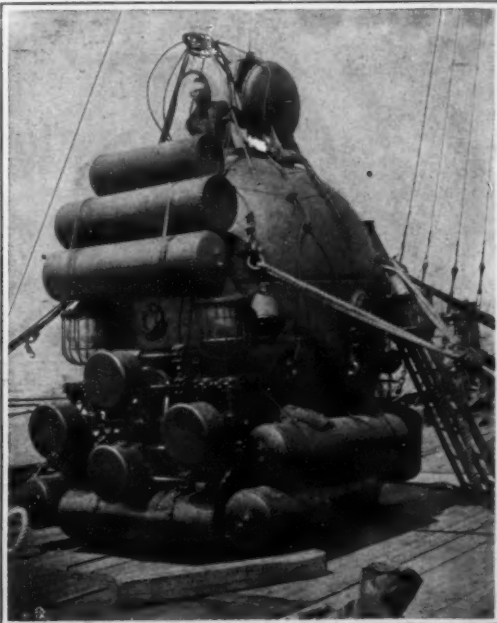
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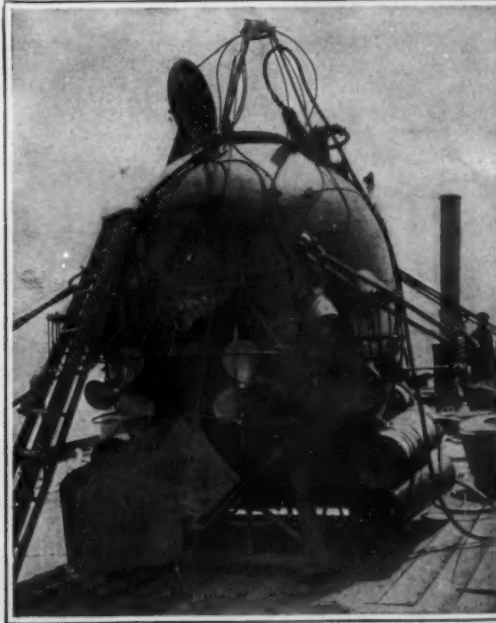
A railroad school where young women are taught telegraphy and train dispatching by means of miniature trains

telegraphy and train dispatching by means of a miniature railroad equipped with moving trains and signals, duplicating those in actual use. Already, nearly 200 applicants for the course have been enrolled.

The first thing taught in entering the school is the Morse code—that series of dots and dashes which, to the trained mind, carries messages of the greatest import. A room has been fitted up with complete sending and receiving apparatus to care for 50 students at a time.



Front view, showing electro-magnets and drilling mechanism



Rear view of the salvage submarine, showing rudder and propellers

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Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

Improving the Buzzer for Wireless Telegraphy

THE electrical buzzer is a most valuable instrument in wireless work. Early in the development of radio communication, the electrical buzzer was employed for testing the sensitiveness of the filings coherer, making certain that the receiving set was ready to respond if a transmitting station should happen to be working. And to this day the buzzer has remained an important adjunct to radio work.

As in the case of other apparatus, the buzzer has undergone marked changes from the crude form employed on bell circuits. The aim has been to obtain a greater rate of vibration from the armature, so that the interruptions would be of a high order. This has called for delicate adjustments and good contacts, so that the present radio buzzer bears about the same resemblance to the conventional buzzer that an automobile bears to a wheelbarrow.

Typical of present day radio buzzers is the one shown in the accompanying illustration, which is the design of Louis G. Pacent of New York city. It is fitted with lock nut levers for permanently locking the adjustments after the proper pitch or note has been obtained. No tools are required. The base is of composition, while the black-enameled brass case is fastened on by a bayonet socket arrangement. This buzzer which is necessary for exciting radio oscillating circuits for measurement work and detector tests, has been approved by the U. S. Navy. It can be adjusted to give a tone of 500 cycles or 1,000 sparks per second, simulating the signals of most modern transmitters.

Protection Against the Submarine

THE introduction of ruthless submarine warfare in the present conflict has set the inventive world to thinking. Suggestions by the thousands have been pouring in to our Government. Unfortunately the majority of them have been based on inadequate knowledge of the problem in hand. Naturally there has been a great deal of duplication and we find hosts of claimants for the same idea.

Pictured herewith are a number of typical patented inventions, which serve to illustrate the lines of thought

pursued by different inventors. Some seek to ward off the torpedo; others take it for granted that the ship is to be struck, and provide in the ship means calculated to offset the destructive effect of the torpedo; while still others propose to explode the torpedo at such a distance from the ship that the latter will not be injured.

In Fig. 1, for instance, we have a ship surrounded by a cellular belt below the water line, the cells consisting of hermetically sealed tubes from which the air has been exhausted. By having the belt made a part of the vessel and following its contour, the inventor seeks to overcome the objection that applies to many other protective devices, namely, that they are liable to be

the vessel of a large share of its buoyancy on one side. This would produce a serious list which might even be enough to capsize the ship.

The invention illustrated in Fig. 5 has a similar object in view. In this case, however, the belt consists of a mass of cables which is of about the same specific gravity as the water, so that should a portion of the belt be blown away, the water taking its place, would not alter the center of buoyancy of the vessel. Unfortunately, a belt of this sort would be a very cumbersome object for a ship to drag through the water and because of the high skin friction would rob the vessel of its speed.

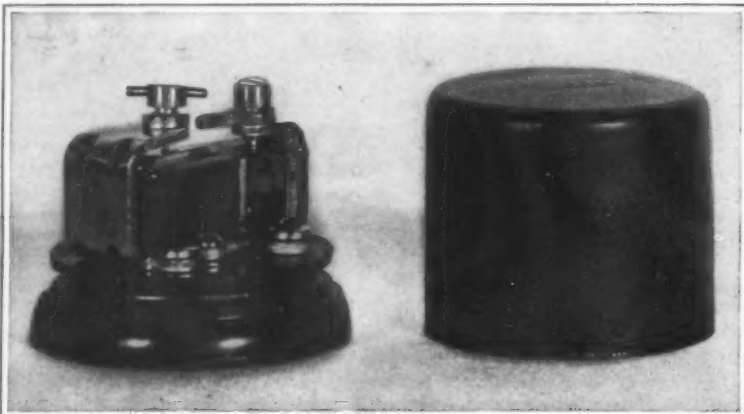
In Fig. 3, we have another form of belt consisting of a series of springs somewhat on the order of the coil springs used for beds, which support an outer sheathing of slats. The inventor expects this yielding shield to prevent the explosion of the torpedo. The inventor apparently does not know that a torpedo is provided not only with a firing pin which projects from its forward end, but with a delicate internal mechanism operated by momentum, which will discharge the torpedo if it is swerved from its course or if its speed is checked. This same lack of information is evident in the invention in Fig. 2, which is fitted with deflecting planes projecting in all directions so that it cannot be struck squarely by a torpedo, but will deflect the torpedo from its course. This vessel is also provided with an overhead deflector calculated to protect the ship from bombs dropped by airplanes. Anyone who has had the slightest experience at sea can

imagine what would happen to the deflectors in a sea-way.

In Fig. 7, we have another modification of the belt idea. In this case, however, means are provided for projecting the belt to a distance of several feet from the side of the vessel, although normally it lies close against the hull. When the ship is in the submarine zone and suspects an attack, the belt or shield at one side or the other is moved out so that it will intercept the torpedo and cause its discharge at such a distance from the side that it will not do the hull any harm.

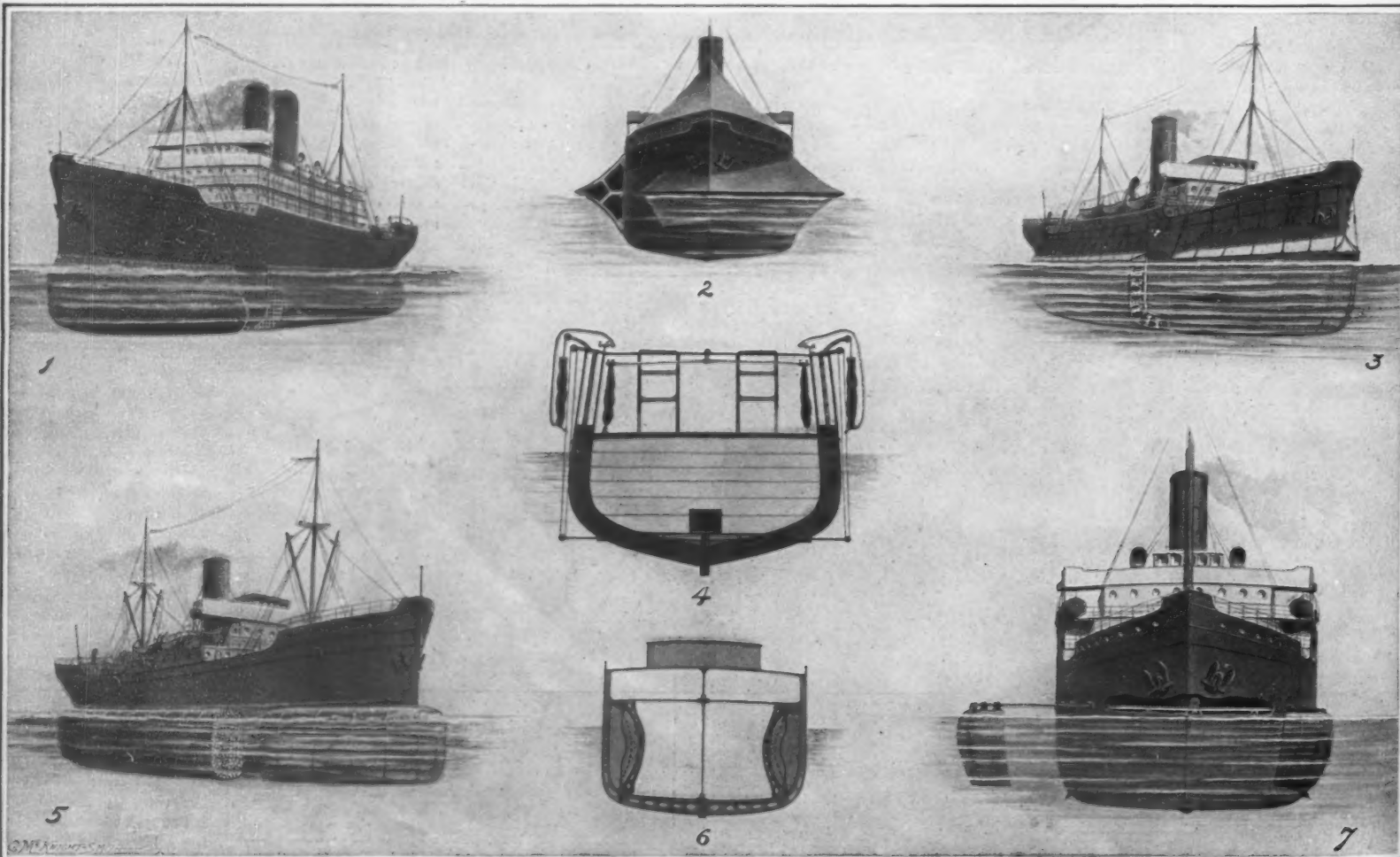
In Fig. 6, is a section of a ship provided with means

(Concluded on page 580)



This is what radio men did to the conventional electrical buzzer in adapting it to their needs

torn off by the action of the waves. Such a belt would not interfere materially with the steering of the vessel, which is another feature that is apt to be overlooked by inventors. The purpose of having a vacuum in the cells is to provide empty spaces into which the gases produced by the explosion can flow, thereby preventing the explosive from exerting its utmost force against the hull of the ship. Apparently the quantity of gas that has to be taken care of and its kinetic energy which would cause it to deal a heavy blow to the hull of the vessel, despite the allurements of the vacuum cells, have not been estimated. Then, too, the inventor apparently forgets to take into account the effect of suddenly robbing



Some recently patented inventions for the protection of ships against submarine attack



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RECENTLY PATENTED INVENTIONS

Electrical Devices

PNEUMATIC TELESCOPIC MAST AND ITS APPLICATIONS.—M. GUICHARD, Paris, France. The invention has for its object a special device for pneumatic telescopic masts, used for wireless telegraphy or telephone stations. It comprises a plurality of tubular elements collapsible within each other, means for maintaining air-tight joints between the same, guys fixed to the tubular elements, manually operated means attached to the uppermost tubular element and adapted to exert vertical traction force at the apex of the mast during extension or collapsing of the mast.

SHADE HOLDING ADAPTED FOR INCANDESCENT ELECTRIC LAMPS.—F. PENNY, Electrical School, Navy Yard, Brooklyn, N. Y. The invention relates to an incandescent lamp shade holding adapter or combined lamp shade holder and attaching plug especially designed to permit the entire device to be removed as a unit from any standard screw base socket permanently installed so that a vacuum cleaner, heating device or the like can be applied to the socket without the trouble or necessity of loosening the shade-holding screws, as is now commonly the case.

DEVICE FOR SHIFTING CURTAINS OR THE LIKE.—E. J. VELLE, 73 Nickel St., Akron, O. An object of the invention is to provide a device for shifting curtains first in one direction and then in the reverse, the one movement being accomplished by the closing of an electric switch and the next or reverse movement being accomplished by a single manipulation of the same electric switch. A further object is to provide an electric motor whose rotation in one direction will serve to draw the curtain and also to actuate a pole changing device, while the rotative movement in the opposite direction will cause a reverse movement.

Of Interest to Farmers

STUMP PULLER.—F. WERRE, Port Arthur, Texas. The object of the invention is to provide a device for use in connection with a hoisting derrick, wherein a lever is provided having means for connecting the same with a stump near one end, the end being adapted for engagement by the hoisting mechanism of the derrick, and being supported by a trackway on opposite sides of the stump, the other end having means engaging the boom of the derrick to provide a fulcrum.

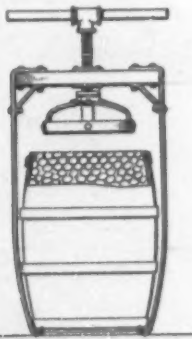
Of General Interest

POTATO PEELER.—J. M. HOWARTH, 622 Grand Ave., Wausau, Wis. The invention has for its object to provide a device in the form of a rotating container into which the potatoes to be peeled are placed, the container having peeling means for shredding the peeling from the potatoes, and with which the potatoes are thrown into contact as the casing is rotated, the casing having means for spraying the potatoes as they are peeled to remove the peelings and clean the peeled potatoes.

METHOD OF WELDING.—C. H. BROWN, 3705 Hueco St., El Paso, Texas. The invention provides for methods of welding in inaccessible places, as, for instance, in motor trucks, wherein the break is in such a position that it is not accessible from the inside, and wherein the outer face of the frame must be straight and smooth, and the method consists in bending in the broken ends, and welding them together and in afterward filling in the gutter formed at the bent in portions flush with the outer face of the frame.

PLUG FOR DRUG WELLS.—J. G. ROBINSON, 226 E. 3d St., Tulsa, Okla. The invention relates to means for plugging dry wells, as for instance, oil or gas wells, to prevent salt water flowing from the well that might penetrate gas and oil sands, drowning production in adjacent wells, wherein the plug is so constructed that it may be shipped knocked down and assembled at the well. The device comprises a plug composed of a central frusto-pyramidal block and wedge-shaped blocks fitting the outer face of the pyramidal block and forming therewith a cylindrical body.

BARREL-HEAD PRESS.—F. L. MEHRING, R. F. D., No. 3, Box 78, Charlottesville, Va. An object of the invention is to provide a barrel head press, including as one of its essential features, the novel construction of follower with the resilient follower arms and the ball bearing on the screw shaft. In operation the spring arms are first



A SIDE ELEVATION OF THE DEVICE

hooked over the lower line of the barrel, the follower occupies an elevated position over the contents of the barrel. The follower is screwed down until the ring meets the head and by further pressure springs into place in the annular groove near the upper edge of the barrel.

LEMON SQUEEZER.—G. H. JENNINGS, Jennings, La. This invention relates to the type of

lemon squeezers in which means are provided to eject the rind or squeezed lemon. It has for its object to improve in various particulars lemon squeezers so that the ejector will be unfailingly operated to eject the squeezed lemon and unfailingly caused to resume its position after ejecting movement.

RAZOR.—J. W. FISCHER, 169 State St., Brooklyn, N. Y. The object of the invention is to provide a razor of the usual type with two safety guards, arranged to permit using the razor without the safety guard if necessary. The guards overlie the sides of the blade, one being adapted to form a handle while the other overlies the corresponding side of the razor blade. Use is also made of means for fastening the free ends of the guards together to provide a casing for the razor blade or a handle whenever desired, the device can be used in either hand for safely shaving both sides of the face.

UMBRELLA.—E. CALUSINSKI, 851 N. Winchester Ave., Chicago, Ill. Among the principal objects which the invention has in view are to provide a structure which may be folded within small compass, to simplify the operation of folding, and to strengthen the construction. The invention has ribs formed of three sections. The sections are connected by means of pins and braces the rod is made of tubular sections, telescopically united. The combined length of the cane and handle is equal to the combined length of the tubular sections and the rib sections, and with the cover form one small package.

PIE CARRIER CABINET.—C. C. BLALOCK, address H. L. McCune, 701 Two Republic Bldg., El Paso, Texas. The invention relates generally to carrier cabinets but more particularly to cabinets for the use of bakers pie. An important object is to provide a cabinet possessing strength with lightness, which may be cheaply produced and assembled into cabinet form, which is readily accessible, and convenient for the placing in, examining or removing of the contents.

CHECK REGISTER.—D. A. VALVANO, Wood Ave., Linden, N. J. The object of the invention is to provide a register particularly for use in barber shops, although it may be used in other places where it is desired to show automatically the checks removed. Another object is to provide a register for each user with different columns of checks with a plurality of indications along-side the columns showing the cash value of the checks removed.

UMBRELLA CONSTRUCTION.—K. C. HOUT, 138 Hudson Ave., Albany, N. Y. The principal objects of the invention are to simplify the construction of umbrella frames, by reducing the labor factor in constructing and assembling the frames, and to provide means for dismembering the frames to facilitate repair. The construction comprises a plurality of pivoted members, a pivot mounting therefor embodying a flange with a series of perforations adjacent the perimeter, means for engaging the members with the flange, such means embodying resilient hooks rigidly attached to the members.

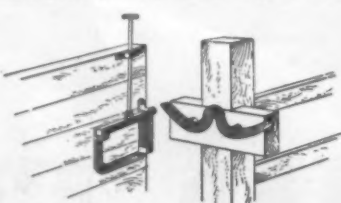
ATTACHABLE HANDLE.—A. W. DYE, 27 Burlington St., Gloversville, N. Y. The invention relates particularly to handles adapted for use on dishes, shallow pans, and the like for frying over camp fires. A further object is to provide means for securing an extension handle which may be cut from green wood and applied to the permanent handle member of the device, the attaching means serving to securely hold the extension even after shrinkage.

UMBRELLA COVER ATTACHMENT.—K. C. HOUT, 138 Hudson Ave., Albany, N. Y. Among the principal objects which the invention has in view are, to reduce the cost of securing an umbrella cover to the umbrella frame, to strengthen the umbrella construction, and to cheapen the cost of umbrellas. The cover fabric sections are united to form a seam, each seam is superposed in line with the umbrella ribs, which are U-shaped in cross section, a plurality of clips clamping the cover to the ribs.

METHOD OF CHARTING AND CUTTING UPPER LEATHERS.—A. L. McMASTER, 34 Bowdoin St., Dorchester, Mass. An object of the invention is to provide a method whereby an animal hide may be marked or charted so that the various portions of the hide may be designated as regards quality, and a guide provided to assist in the cutting operation. Another object is to utilize the charting of each hide in making a stencil, so as to preserve in permanent form the laying out and cutting ability of individual cutters, for the purposes of instruction and further cutting operations.

Hardware and Tools

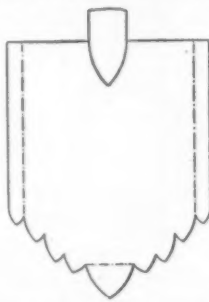
GATE LATCH.—J. H. JUNGEMANN, Concordia College, St. Paul, Minn. The invention is more particularly intended for embodiment in a gate latch of the type in which a latch bar is adapted to be guided into latched engagement with a strike plate by means of guide surfaces



on the latter. An object is to provide a pivoted spring-pressed latch bar movable for unlatching, by a push rod, and a latch plate presenting a recess or inverted notch at the under side, to

which the latch bar is guided and into which it is automatically pressed in the closing of the gate.

SHOVEL.—C. SINGER, 91 Forest Parkway, Woodhaven, L. I., N. Y. The object of the invention is to provide a shovel with a central tooth and teeth arranged in curved series at opposite sides of the central tooth, each of the teeth having sharpened convex cutting edges

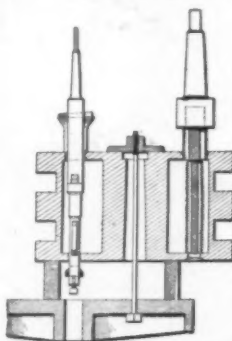


A FRONT VIEW OF THE INVENTION

so that the shovel may operate against the earth and foreign matter therein with comparative ease. The shovel is intended for general use, but is particularly designed for digging trenches, as in warfare, where in woods roots are encountered, the cutting members at the sides permit the cutting of roots of most any size.

LIFTING JACK.—H. I. BENEDICT, care of Gibraltar Jack Co., 1902 Broadway, New York, N. Y. A specific object of the invention is the provision of a jack in which the elevating element embodies a buttress screw which is engaged by releasable dogs on the vertically movable section of the jack, there being means for releasing the dogs so that the jack can be easily and quickly collapsed and at the same time the screw and dogs permit the vertically movable element to be raised or pulled out without operating the gearing, thus enabling the jack to be quickly adjusted to the load to be lifted.

COMBINED BORING-TOOL AND COUNTERSINK.—B. W. BERRY, 1250 18th St., Portsmouth, Ohio. The invention relates to a combined boring tool and countersinker, it has for its object the provision of a device especially adapted for preparing piston heads to receive the plugs. The



A SECTIONAL VIEW OF THE TOOL

improved tap consists of two portions of unequal diameter. At the upper end of the tap is a shank similar to the shank for engaging the socket of the chuck which is in effect an extension chuck.

Heating and Lighting

HEATER.—J. RIEGEL, 119 South St., East Mauch Chunk, Pa. The object of the invention is to provide a heater more especially designed for use in dwellings to furnish steam or hot water to radiators for heating purposes and arranged to enable the user to heat the rooms more or less according to the seasons. To accomplish this, use is made of two boilers, of which one is the delivery boiler for delivering steam or hot water to the radiators for heating the rooms, and the other is a feed water heater connected with the delivery boiler to supply the latter with heated water, the second boiler receiving the return water from the radiators supplied by the delivery boiler.

STREET LIGHT.—F. MILLIKEN, 55 John St., Lawrence, N. Y. The invention has for its object the provision of a construction, which may be used in the double capacity of a lighting device and signal device. Another object is to provide a street light which will produce flashes of light intermittently and thereby attract the attention of persons passing. A further object is to provide a light which is easily movable, and adapted to be placed at crossroads or any point.

Machines and Mechanical Devices

CAPPING-HORSE FOR HOLLOW GLASS CYLINDERS.—S. B. HENSHAW, care of Charleston Window Glass Co., Charleston, W. Va. The invention relates generally to glass machinery and more particularly to what is commonly known as a capping horse for the support of a drawn hollow glass cylinder during the cutting thereof into lengths. The device includes a supporting frame, a plurality of supporting arms pivotally connected to the frame having cylinder receiving portions at one side of the frame, and retractile springs extending from the frame and detachably engaging portions of the arms at the opposite side of the frame.

HEAD-MOTION FOR LOOMS.—A. H. LANDRY, Box 624, Tilton, N. H. The object of the invention is to provide a head motion for looms, more especially designed for weaving plain and fancy stripes, and arranged to positively actuate the harness and to allow of running the loom at a high rate of speed without danger of

producing imperfect weaves. For different weaves, different sets of cams are used. If it is desired to make only one twill weave in a piece of cloth, it is only necessary to use one set of cams and one gear wheel and one shaft.

VALVE LIFTER.—C. LIECK, Great Neck, L. I., N. Y. The invention has particular reference to an implement for manipulating valve springs of internal combustion engines. An object is to provide a valve lifter embodying a substantially bell crank lever having a rocker fulcrum, the fulcrum member and one arm of the lever being adapted for action in the nature of a toggle whereby a maximum throw of the lifting end may be effected with a minimum throw of the handle end, yet with a moderate expenditure of power.

ANTIFRICTION BEARING.—J. W. THOMPSON, 920 E. State St., Trenton, N. J. The invention relates to antifriction bearings for rotary shafts supporting and moving relatively heavy loads and resisting heavy load pressures. The invention consists of a bearing having one or more independently mounted rollers for supporting the load shaft and means to retain the rollers in a fixed angular position with relation to the load shaft the said rollers being mounted on antifriction bearings.

SHORTHAND MACHINE FOR THE BLIND.—C. L. CHINNOCK, care of Edison Co., 130 E. 15th St., Brooklyn, N. Y. The invention relates to finger operated machines such as typewriters or the like, and has particular reference to stenographic or shorthand machines. Among the principal objects is to provide a machine of unusually simple construction adapting it peculiarly for convenient manipulation by blind operators. The principal of operation of the machine depends upon making upon a paper or other analogous ribbon or tape certain impressions adaptable for reading by the sense of touch.

ROAD MACHINE.—R. R. HART and I. N. DE HART, Route B, Box 78, Tulare, Cal. The main object of the invention is to provide a machine which will cut a rough surface and reduce the same to mulch, which will carry the mulch from the edge to the crown of the road, leveling high spots and filling low spots, and which will then smooth the mulch so leveled, means are provided that the cutters, pulverizers, smoothers, and levelers, may follow the contour of the road.

MILLING AND GRINDING ATTACHMENT FOR MACHINE LATHES.—W. H. HOLLOPETER, Burns, Ore. The object of the invention is to provide a milling and grinding attachment for lathes provided with vertical and transverse manual and automatic feeds in addition to the longitudinal feed, either automatic or manual. The attachment comprises a carriage having an opening through its upper portion, a vertical column with a head and a rack, a shaft journaled in bearings in the carriage, gearing connecting the shaft with the teeth of the rack, a table adjustable on the head and means for securing the table to the head.

Medical Devices

SURGICAL AMPUL.—W. J. SCHIEFFLIN, 5 E. 66th St., New York, N. Y. The invention relates to an ampul or capsule container designed to hold a tincture of iodine or any other antiseptic fluid, the invention has to deal more particularly with a non-breakable container, whereby it is especially adapted for army use, although not limited thereto, it is easily portable, made of paraffin wax or ozocerite, can be readily opened by the teeth or finger-nail, if one hand only is available, the ampul contains two mls. Tincture of iodine half-strength U. S. P. all of which can be utilized in dressing the wound as slowly or rapidly as desired. Any portion of the tube unused can be saved for further use by closing the tube with heat.

Prime Movers and Their Accessories

MANIFOLD FOR INTERNAL COMBUSTION ENGINES.—J. G. BARNDALE, address Horatio V. Gard, Attorney, Superior, Wis. This invention has for its object to provide a combined inlet and exhaust manifold, wherein means is provided in the intake part of the manifold for slowing the movement of the fuel and for thoroughly breaking up the same to provide for complete volatilization of the same, and wherein means is also provided for preventing the formation of carbon in the intake portion of the manifold.

Pertaining to Vehicles

LENS FOR AUTOMOBILE HEADLIGHT.—E. W. NEWTON, Room 706, Heyworth Bldg., Chicago, Ill. The invention relates particularly to a lens adapted to automobile headlights, the object being to provide a highly polished, pressed glass lens, the construction of which permits of an effective light diffusion, and especially of economical manufacture of fire-polished ware of this nature. The device having a substantially concave-convex body and a foot portion projecting beyond the outer face at its center, a light diffusing shutter adjustably supported on the foot portion to permit of more or less unobstructed passage of light.

MOTOR HOOD.—D. McR. LIVINGSTON, 150 E. 36th St., New York, N. Y. The invention relates to a hood for internal combustion engines or motors, and more particularly to the type of motor hood formed of hinged sections or panels, the sections being hinged along side lines and a line extending along the top. The purpose of the invention is to provide a hood with means at the top joint whereby rain or other water entering through the joint will be prevented from dripping on the motor, thereby producing undesirable results or danger by short-circuiting the spark plugs.

(Concluded on page 576)

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RECENTLY PATENTED INVENTIONS

(Concluded from page 574)

Of General Interest

FINGER COT.—G. M. SHUMAKER, Route 3, Box 55, Lexington, Ohio. The object of the invention is to provide a device adapted for connection with a rubber glove in place of a removed finger or thumb, wherein the stall is provided with a connecting ring of sufficient size to prevent pressure on the finger and heavy enough to hold its shape when in use to prevent undue pressure on the finger or thumb.

ROADWAY.—S. B. DICKINSON, Bath, N. Y. The invention relates to built up structures for vehicles of different kinds which will permit excessive use without injury to the roadway or the vehicles. Another object is to provide a roadway with spaced metal tracks or ways for certain classes of vehicles, and a central roadway for other vehicles, the metal tracks are made to act as a drainage structure for drawing off excess water from the road.

BED LEG.—L. L. SCHELLINGER, McGraw, N. Y. The invention relates more particularly to plurality of tubular legs having means whereby the length may be controlled to vary the distance between the surface supported and the supporting surface on which the legs rest, whereby the surface supported may be leveled at any time, in order to compensate for inequalities in the supporting surface itself.

INDOOR CLOTHES RACK.—F. A. SANDMANN, 1870 Myrtle Ave., Brooklyn, N. Y. Among the objects of the invention is to provide a rack, the main portion of which is adapted to be held at a convenient elevation for the purpose of putting the clothes or other commodities upon the rods thereof and then subsequently elevating the same to a position out of the way. In the upper part of the room where drying will be naturally facilitated by the higher temperature prevailing in such place.

WINDOW ATTACHMENT.—C. J. HUTCH, North Branch, N. Y. The invention relates to a window sash fastener, the object is to produce a simple and efficient fastener which comprises a minimum number of parts, which will automatically fit under a sash and lock the sash in open position when the same is raised. The device may be very cheaply and easily manufactured.

WALL CONSTRUCTION.—W. WOODIN, 112 Cedar Ave., Richmond Hill, L. I., N. Y. The object of the invention is to provide a wall for buildings and other masonry structures, arranged with air space between the outer and inner portions, to prevent the penetration of heat, cold, or rain and other moisture, at the same time rendering the wall practically soundproof. In order to produce this result use is made of build blocks, comprising an outer brick, an inner brick and a connecting member for spacing the bricks.

FORCING PROOF DROP STOPPER.—E. ALLIE, Paris, France. The object of the invention is to prevent fraud by obviating the introduction of any foreign matter into recipients intended to contain a special product. The stopper comprises a cylindrical body with suitable perforations in its bottom and a removable cap on top of it, a double closing valve guided, within the cylindrical body, by a knob, two seats for the double valve and a star branched piston for driving downward the double closing valve.

BOAT RELEASING DEVICE.—F. JACOBY, 110 Anderson Place, North Bergen, N. J. The invention has particular reference to a quick releasing device for the purpose of setting a loaded lifeboat free from the davit connections after it is launched. Among the objects is to provide a releasing device of such a nature that the davit connections will not be held reliably for the manipulation of the boat, but also, will be released simultaneously from both ends of the boat so as to obviate any possibility of one end being released before the other.

PLASTER COMPOSITION.—P. S. ANNEKE, 11 Broadway, New York, N. Y. The invention relates to a plaster composition adapted for use particularly in making mortar or plaster for covering walls or similar purposes. The main object of the invention is to provide a composition having hydrated lime as its base but having properties of plasticity, lightness and economy in use that are of especial advantage in such compositions. The composition consists of hydrated lime together with kieselguhr intermixed by intergrinding.

Machines and Mechanical Devices

BOILER FEEDER.—J. RINTA and A. MATSON, address Alexander Matson, 1 Baltic Lane, West Fitchburg, Mass. This invention relates to a boiler feed of that type in which water automatically feeds into a secondary tank from the main tank when the water in the boiler reaches a predetermined low level, and then the flow of water to the auxiliary tank is cut off and the water feeds from the second or auxiliary tank to the boiler to raise the level thereof to a predetermined maximum.

TYPEWRITER CARRIAGE AND PLATEN OPERATING MEANS.—W. A. HOWELL and A. I. V. WILSON, 81 Virginia Ave., Atlanta, Ga. This invention relates to typewriting and other machines embodying a sheet carrier and platen, more particularly it relates to key-controlled means for actuating the carriage and platen without the need of the operator removing the hands from the keyboard, so that at any intermediate position or at the end of the line by the depression of a key on the keyboard, the carriage will automatically return to initial position and simultaneously the platen will turn to move the paper for the next line.

SPOOL CARRYING DEVICE.—C. CALDES, 22 Rutgers Ave., Jersey City, N. J. The object

of the invention is to provide an arrangement of spindle ratchet and associate parts which results in the production of a long wearing, and comparatively light device. Another object is to provide a bobbin or spool support for braiding machines which will utilize a spring for maintaining the tension of the braiding material instead of the weight now in common use, connecting means are provided whereby the spool or bobbin may be used on the same spindle without change.

FLEXIBLE COUPLING.—R. H. ALDRICH, Allentown, Pa. The invention has reference more particularly to the buffers of the coupling. An object is to provide a detachable buffer in the shape of a helical spring adapted to bear at the ends and in the central part. The device comprises a driving member, a driven member, plus extending from the driving through the driven member, a helical spring having its minimum diameter between its ends for each of the pins, the springs bearing on the corresponding pin at its minimum diameter, and means in the driving member for engaging the ends of the spring.

CLOTH LAYING MACHINE.—M. ISAACS, 18 E. 17th St., New York, N. Y. Among the principal objects of the invention are to provide means for drawing and laying cloth from a soft center roll or bolt, to avoid the necessity of supporting a bolt of cloth on a rotating member on a laying machine, to insure an even tension for the cloth while being laid, to provide an adjustable guide, to avoid excessive tension during the operation, and to provide means for laying cloth so that the faces of the different layers will be opposed, without reversing the design or weave characteristics.

SHAFT PACKING.—F. T. NOLAN, Mayport, Fla. The object of the invention is to provide an all-metal packing for shafting which removes all wear from the shaft, it being unnecessary to employ a brass sleeve. The invention provides two collars one of which is secured to the shaft for rotating with it, the other being secured against movement, the last mentioned being held yieldingly extended in the direction of the collar fixed to the shaft, and when desired a compensating ring is employed which separates the two collars.

AIR COMPRESSOR.—C. A. V. CARLSON, Lanham, Md. An object of the invention is to provide a device in which valves are used which are automatically operated by the air itself, means being provided to hold open certain of the valves, as for instance, the section valves during the whole or part of the compression stroke of the piston, so that all or part of the air taken into the cylinders will be pushed back into the section chest instead of the delivery pipe leading to the storage tank.

BOX TRIMMING MACHINE.—A. ISERT, address, Pacific Box Factory, Inc., 351 Beach St., San Francisco, Cal. The invention relates particularly to machines by which the projecting ends of the corner locks of boxes are trimmed even with the outer surfaces of the boxes and preferably at sight levels, the primary object being the provision of a machine which will be comparatively simple and which will obviate the necessity of a skilled attendant. A further object is to provide a machine having its cutters mounted and adjustable upon cutter arbors, so mounted as to permit of ready detachment from the machine.

MACHINE FOR MAKING CONCRETE PAVEMENT AND THE LIKE.—A. J. PARRISH, Paris, Ill. An object of the invention is to provide a power driven device which will strike off freshly laid concrete, stamp the concrete to sink the coarser aggregate and permit the mortar or finishing aggregate to come to the surface, and then smooth the stamped surface, thus imparting a final finish to the pavement. A further object is to provide a device in which a frame bears the different members, means being provided to raise or lower the frame so as to make the machine applicable to pavements of different kinds.

Pertaining to Recreation

TOY.—A. Z. BAKER, 393 Mulberry St., Newark, N. J. The invention relates to an inexpensive wheeled toy which is characterized by a wheeled platform carrying a reciprocating member operable from the wheels and which carries members movable relative to the platform. Another object is to provide a toy representing some animal some of the actions of which are synchronized by the wheeling of the toy.

Pertaining to Vehicles

BRAKE.—E. J. LEE, address Never-Break Products Co., Bangor, Pa. The object of the invention is to provide a brake particularly adapted for use on automobiles, and in which the brake shoe is provided with integral jaws which are bent and riveted to the body of the brake shoe, shims being detachably mounted on the jaws for engaging the brake cam, so that the lining or wearing member on the brake shoe may always be disposed relatively to the brake drum in the best operative position.

AUTOMATIC CENTRIFUGAL STARTER-LOCK FOR AUTOMOBILE ENGINES.—J. V. and T. E. BOYETTE, care of Automatic Starter Lock Co., Mobile, Ala. The principal object of the invention is to provide a speed responsive or centrifugal device operable from one of the driven shafts of an automobile engine for rendering impossible the coupling of the started motor and the engine motor while the latter is running.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

The New Mississippi

(Concluded from page 561)

Government and its use was in line with the policy of Government to place barges and tow boats at the service of shippers. The load of plows was followed in a week or so by barges which carried coal up the river and returned down stream with iron ore. These shipments went to and from St. Paul and only those living on the upper river can appreciate what an innovation this was. As the barges passed the river towns, bells rang and whistles blew; for here were actually freight boats whereas it has been customary for freight to be shipped only in the holds or on the lower deck of the passenger steamers.

These passenger steamers operate between St. Paul and St. Louis but will come to Minneapolis this summer. They carry local freight and passengers and though navigation is closed for at least four months in winter, they have done a good business. It is interesting to note that they are built almost exactly as those of 70 years ago and are so distinctive that they are called "the Mississippi type." Before the introduction of steam, flat-boats were used on the river and these were propelled either by drifting or by using sails or poles. When steam was introduced the shallow places made it advisable still to use boats drawing little water, and the flat hulls were retained. This necessitates the piling of freight on the deck above the water. The uncertainty regarding the depth of water from day to day at times has caused heavy expense in holding cargoes until a suitable depth favored traffic and has been a discouraging feature of shipment on the Mississippi. The necessity for increased traffic facilities leads those interested in the river to hope that in time there will be an end to flood menace, soil erosion and shifting channels and that rail terminals and storage facilities will be a reality.

Those who are working for the development of Inland Waterways and in particular for the utilization of the Mississippi as a carrier hope that there will be as much traffic as on the Ohio and as on the Missouri from Kansas City to St. Louis. Both of these rivers are used extensively and an experiment was recently carried out successfully in the shipping of pig iron from Sheffield, Ala., to Peoria, Ill. The pig iron, was manufactured near Birmingham and shipped by rail to Sheffield on the Tennessee River. It was here loaded on three barges and carried to Peoria. This trip on the Tennessee, Ohio, Mississippi and Illinois rivers was made according to schedule except that at the Copperas Creek Lock, Illinois River, low water made it necessary to lighten the cargo by using a fourth barge.

It is generally conceded that if the efforts of New Orleans and Minneapolis to obtain greater use of the Mississippi succeed, the terminal facilities of all river towns must be greatly improved. For several years the Mississippi Valley Terminal League has been urging the need of proper terminals if freight is to be handled successfully. Kansas City, which uses the Missouri extensively, has municipal docks equipped with every modern convenience for loading and unloading and this is needed by the cities on the Mississippi. Terminals have been finished or are under way at East St. Louis, Davenport, Muscatine, Minneapolis, Hamilton, Keokuk and other river towns. In fact for the first time since the days when Mississippi River traffic flourished because there were no railroads to compete, these cities and towns are awakening to the fact that they are behind the times and need proper municipal docks and terminals and a water-front storage system.

New Orleans not only is interested in the development of the Great River but is cognizant of the advantages of foreign shipment and the necessity of qualifying for increased interest and intercourse with the outside world. The Government has already spent about twenty-one million dollars on the deep sea channel to the Gulf, the bank revetment and the harbor. The river frontage is publicly owned by the terms of the Louisiana Purchase, and the

Board of Port Commissioners have completed at large cost a modern system of docks, wharves, steel sheds, and coffee, grain and general warehouses. Plans are maturing to connect Lake Pontchartrain and the Mississippi River, and where railroad cars have not been available sugar has been shipped to New Orleans from Louisiana plantations on barges which have been put on the narrow channels. A general plan of the New Orleans water front includes many miles of steel receiving and discharging sheds, a large public grain elevator, and other important units. A public belt railroad connects wharves, warehouses, factories and other buildings and is a factor in developing commercial economy. The whole city seems awake to her position and the desirability of preparing for a world commerce. The changing transportation economy of the Federal Government is a factor in the outlook but all the river towns must join hands if the Mississippi Valley is to look forward to a new era.

Latin-America, for years dependent on Germany for certain commodities, is beginning to look to New Orleans to supply some of them. This may mean much when taken in connection with the Panama Canal. At any rate, those bent on uniting the best interests of the two Americas consider the port of New Orleans and the improvement of the Mississippi as essential features in the establishment of this trade. There is not a branch of the Mississippi which is not navigable for a long or short distance and thousands of miles could be added if proper dredging, blasting and locks were made factors. There are those enthusiastic enough to contend that under proper conditions ocean vessels could go to St. Louis, Cincinnati, and Pittsburgh, and load at these points for all parts of the world. Great impetus has already been given to open a channel from the Great Lakes to the Illinois River and thence to the Mississippi.

Now that the Government will cooperate and that barges may be had in sufficient numbers on the river, business will receive an impetus. For success water terminals must be constructed in accordance with appropriate plans, water transportation lines must be established with sufficient capital, and there must be complete co-ordination between them and the railroads. This last is at this time a national duty. The committee on river and harbor appropriations has properly emphasized that only those harbors and rivers will be improved where cities and localities offer satisfactory assurance of cooperation in providing transportation lines, water terminals, and interchange of traffic with the railroads.

Bone and Sinew for Our Aircraft

(Concluded from page 564)

men, the principal tenet of which is that its members are giving as valuable a service to the United States as are the men in the trenches. The Legion is promoted entirely by the Government itself, through the War Department. Its members are required to subscribe to this pledge:

"In consideration of my being made a member of the Loyal Legion of Loggers and Lumbermen, I do hereby solemnly pledge my efforts during this war to the United States of America, and will support and defend this country against enemies, both foreign and domestic. I further agree faithfully to do my duty toward this country by directing my efforts every working day possible to the production of logs and lumber for the construction of army airplanes and ships to be used against our common enemies. I will stamp out any sedition or acts of hostility against the United States Government which may come within my knowledge, and I will do every act and thing which will in general aid in carrying this war to a successful conclusion."

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desirable, it has been difficult to attract laborers to the forest. This trouble has been aggravated by the propaganda carried on through the I. W. W. and other agencies, with the evident object of holding back production. Strikes had been fomented frequently and have badly crippled the industry. There have been, besides, deliberate attempts to destroy property, both by direct and by indirect methods. During a fire in the Olympic National Forest last summer, a force of men employed to fight the fire actually struck while the flames were spreading through the timber. Many "accidents" to machinery have delayed operations. Emery dust thrown in bearings, spikes driven in logs that are to be sawed, boilers drained while the engine fires are banked and fires in sawmill property are among the most frequent of these. The impudent and insidious methods of the sabotage advocates are illustrated by cards distributed among the loggers, from which this is an actual quotation:

"Don't drive a spike in a log, as it isn't good for the saw that hits it; don't leave a dried log buried in combustible material near the railroad track, as a locomotive might come along and set fire to it—and you would be a hundred miles away."

However, the I. W. W. has been fought until the number of "Wobblies" in the spruce camps has been greatly reduced, while those who are left are afraid to act with their former boldness. In his fight against disloyalty, Colonel Disque went to the root of the evil—the professional trouble-maker and the unsatisfactory working and living conditions. The agitator was treated with scant courtesy. He was told very plainly that it was not healthy for him in the camps—and he got out, the great body of the working men as well as the employers applauding his departure. Then Colonel Disque turned his attention to the conditions that caused dissatisfaction.

First he armed himself with authority from the President to commandeer every foot of timber in the Pacific Northwest. It was a mighty weapon to wield against the sawmill men, if it became necessary; but it did not. The Colonel at once called more than 200 mill owners into secret conference. He presented his plan to take over control of hours, wages and living conditions; and the mill men, as a patriotic duty, approved it. A few days later he conferred with the labor delegates and they too voted unanimously to place their grievances in his hands. His next step was the announcement of a working day of eight hours, instead of ten, with pay and a-half for overtime. He put into effect a stipulation among the employers to provide clean bunkhouses and bedding. A requirement that the lodgers furnish their own bedding has always been a serious point of contention.

The arrangement was received with general approval. It applies to 62,000 men in the lumber industry of Oregon and Washington, including those getting out Douglas fir for ships as well as the spruce workers. In conceding the eight-hour day the owners gave up a fight they have been waging for years. They have not fought the eight-hour day as a principle, but have opposed its application to the Pacific Northwest until it should be put into effect throughout the United States—a reasonable enough attitude. The result of the program outlined has been the same here as in every other industry to which a similar one has been applied. To the credit of labor be it said that once it is clearly established that the men are really working for the Government and not for private interests, once they are made to feel that there can be no possibility of undue private profit for their employers from their efforts, they have been willing to put forward those efforts without stint.

Here are a few things which the Spruce Production Division has accomplished: It has reduced overhead charges anywhere from five to fifteen dollars a thousand feet. It has increased production until in February it was four times what it was when Colonel Disque took hold. It has

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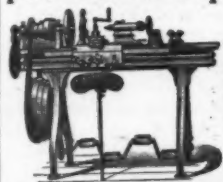
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put 2,000 soldiers with logging experience into the woods. It has stabilized labor and secured more and better labor; it has reduced hours of work and improved working conditions. It has organized a traffic department that handles 400 cars a day, and that gets them through to the Atlantic coast in ten days instead of 50. It has bought \$1,000,000 worth of wire rope, \$1,500,000 worth of logging engines, \$700,000 worth of steel rails—all equipment that was desperately needed, but which the operators could not get delivered to them. It has kept the sick rate in the spruce division below 2½ per cent. It has opened a central cutting plant equipped to utilize logs and parts of logs that formerly would have been discarded. Special machinery saws sections at any angle from timber with curly grain, knots, or other faults ordinarily sufficient for rejection; and in this way is got 30 per cent more airplane lumber from the logs than in an ordinary mill.

The heads of the Spruce Production Division are not going to have much idle time while the war lasts. The employment and maintenance of an industrial army is but one of the tasks devolving upon them. Additional logging roads are being built and more sawmills erected. The finished product must be inspected, classified and rushed to the airplane factories in the East, or to eastern ports for shipment to the factories of our Allies. Oregon and Washington mills are putting spruce first. The railroads are giving spruce shipments preference over all other business. That spruce production is to have the right of way over everything else is the general understanding.

With the increasing importance of air warfare and the promise of continued interest in aviation in times of peace, it is good to know that our forests contain great quantities of airplane spruce. In Oregon and Washington alone there may be found, roughly speaking, ten billion feet; while the great untouched forests of British Columbia and Alaska could supply for years a world a-wing. So the raucous discord of the saws in a hundred mills of our Pacific coast is really a patriotic melody which we may hope to maintain for many, many years.

Strategic Moves of the War

(Concluded from page 566)

on man power and for that reason, our own troops are being hurried abroad as rapidly as possible to add their weight when the hour of advance strikes.

About the date of the beginning of the German thrust in the Aisne sector, a most brilliant operation was carried out by the Italians in the region of the Tonale pass northwest of Trent where the great Presena Mountain was taken by a direct assault of the Alpini under a heavy fire. This victory was won in fighting on ground at least twelve thousand feet above the sea in the midst of melting snows and glaciers. The capture of the mountain which dominates the Camonica plateau and valley cuts off the approaches to passes further south, and also closes at least one line of advance, should the Austrians attempt a western movement north of Trent. It is said that, in the battle, the Austrians lost 3,000 men. Other minor operations have been carried out in the Cape Sile sector on the lower Piave where success has generally lain with the Italian troops. If Germany and Austria intend to launch a great offensive against Italy, the latter may not wait for it but may strike first. It is said that the Italian army with the support of Allied troops is in splendid condition to receive any attack or to begin an offensive movement. The army has been entirely re-equipped since the retreat from the Isonzo front to the line of the Piave and Brenta Rivers. It has also been liberally fitted out with artillery, not only from its own stores, but from Allied reserves as well. At any rate, everything indicates that the army is in better condition and occupies better defensive positions than ever before.

The situation in Italy, as in France, is that the Germans are held no matter where they may strike; both countries, however, await American aid until the man power

is so increased that blows may be struck on both the Italian and western fronts. That Italy has men to spare is shown by the fact that Italian troops have taken up positions in the sector around Arras and it is expected they will soon be in the fight against the Germans. Reports have stated that at least two hundred thousand such troops have reached the western front and that French military critics speak in the highest terms of their efficiency and morale. At any rate, a much better showing than was the case in the fighting last year will no doubt be made and their efforts will have a more fortunate ending.

Toward the end of May, the Greek army, coöperating with French artillery, struck a heavy blow at Bulgarian positions on the Struma River in Macedonia and drove the hostile forces back for more than a mile on a nine-mile front. A large number of Bulgarian and German prisoners were taken, together with quantities of war material. This appears to be the first important battle in which the reorganized Greek army has taken part since the abdication of the German sympathizer, King Constantine. A French military commission was sent to Greece at the time and, under its direction, more than three hundred thousand Greek troops have been trained for the Balkan offensive that has been promised for this spring or summer.

The Italian army on the western part of the lines in Macedonia and especially in Albania is doing a great work in helping and improving the condition of a population such as the Albanians are, who stand in need of aid and encouragement. Had it not been for the civil and military aid given to these people by Italy, they would have starved. The invasion of the country by the Balkan states was accompanied by the usual unspeakable atrocities, by the destruction of farms and crops, and by the devastation and robbery of flocks of sheep and herds of cattle. The horrors of the invasion caused thousands of refugees to flock to Valona and other parts, and have led to the emigration of a number to our own country. The occupation of Albania by Italian troops has certainly proved the salvation of the people and will lead to the restoration as a nation of Albania proper. Roads have been built in many parts of the country where only paths were previously found, railways, tunnels and bridges have been constructed, and the harbors of Valona and Santa Quaranta, the principal ports, have been improved by the building of docks and piers. Telegraphs, telephones, and wireless stations have been established where needed and even flooded lands in the neighborhood of some of the ports are being drained for agricultural and building purposes. The war, in fact, has brought into this country, so long given over to brigandage and lawlessness, the blessings of civilization and of a stable, organized government.

Germany Planning for After-War Trade

(Concluded from page 570)

industry in Germany is well known. This business, of course, has been severely affected by the war, but careful plans have recently been made to reestablish it in its former vigor. This is being accomplished to a large extent by the amalgamation of many small concerns into a few powerful organizations. The Bank of Thuringia, for example, has bought the greater part of the 3,000,000 marks share capital of the Weiden Porcelain Manufacturing Co. (formerly Bauscher Bros.). To the same concern belong also the porcelain manufacturing firms Kahla, Hermsdorf, and Konigszell and the Lorenz Hutschenreuther Co., which, toward the end of 1917, bought the firm of Paul Muller and now proposes to raise its share capital from 2,000,000 to 3,000,000 marks. Another group of porcelain firms, controlled by the banking firm of Arnhold Bros. of Dresden, includes the C. M. Hutschenreuther Co. of Hohenberg and the Tielsch Co. of Altwasser. Still a third group, controlled by the Dresden Bank, includes the Philipp Rosenthal Co. and the firm of J. Zeidler & Co.

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The outlet through which all this vast trade is flowing—the neck of the bottle—is America's harbors. And how have they kept pace with the growth of the overseas trade? Did they double their capacity between 1905 and 1915? Did they again double between 1915 and 1917—so that the stream of commerce kept flowing swiftly and easily? Will they be ready for 1925?

The intensive expansion of America's harbors is playing a tremendously vital part in the development of our overseas trade and in our commercial progress generally. Nautical men and business men, generally, must follow the projects for port development—the news of shipping and ship-building, and the progress of marine architecture and inland waterways.

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Founded 1871

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Every telephone connection requires co-operation. The slightest inattention or indifference on the part of the person who calls, or the company that makes the connection, or the person who is called results in a corresponding deficiency in service. Each is equally responsible for the success of the service.

Not only is it to the advantage of the individual himself to use the telephone efficiently, but his conservation of the advantages of these national lines of speech benefits all telephone users.

Accuracy in calling, prompt-

ness in answering, clear and deliberate talking, courtesy and patience on the part of both user and operator are essentials of service, and must be mutual for good service.

Efficient telephone operation is vital to the war work of this country. The army, the navy and the myriad industries contributing supplies depend on the telephone. It must be ready for instant and universal use. The millions of telephone users are inseparable parts of the Bell System, and all should patriotically contribute to the success of the service.

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This unit shows our No. 604—75 lbs. of iron-cork insulation—12 1/2 rolls of 1-8 in. brass tubing No. 22 Gauge. Thorough workmanship—selected materials—tested and adopted by those whose judgment is unquestioned.

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Fig. 604

ICE COOLED

Many types and sizes. May have coil on bottom as well as on sides. Tasty—convenient—and efficient. Very attractive appearance.

Olive brown baked enamel finish—Pure white vitreous cast iron enameled bowl. Fittings—nickel-plated. Wastes above or below the floor.

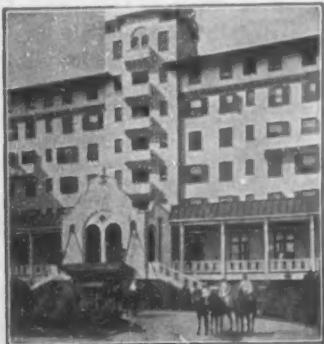
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mans on the large fleet of mercantile vessels which they have safe in their own harbors and to which, according to various reports, they have made large additions since the outbreak of the war. Moreover, the Germans claim to be expecting the return of those of their vessels which were confiscated by the Allied countries as each of them entered the war. However they may be disappointed in this hope, the cessation of hostilities will witness the freeing of German vessels interned in the harbors of such countries as are still neutral. On this merchant fleet, then, Germany has placed great hopes for recovering her trade and among other plans for the future expansion of her shipping is the establishment of a ship mortgage bank in Hamburg. Even before the war the advisability of creating such an institution was frequently discussed in the German press, but it remained for the stimulus of the war to bring the proposal into prominence, and plans have now taken such definite shape that the establishment of such an institution will be witnessed in the near future with a capital of 10,000,000 marks.

Hitherto a special bank for advancing money on the security of ships did not exist in Germany, although its need was widely felt. Smaller shipowners who required money for building and operating their ships were obliged to apply to foreign institutions of the kind, particularly to those in Holland. Ship mortgage banks managed with care, but at the same time liberally, can do much for the assistance of small shipowners, especially those engaged in the so-called tramp trade and in internal shipping, as well as the owners of steam fishing fleets.

The Reichstag recently passed a bill for the restoration of the German mercantile marine and one of the first results has been a number of orders for new tonnage by the more important steamship companies. It is said that shipbuilding yards have recently concluded contracts for the construction of more than 150,000 tons. A supplementary estimate laid before the Reichstag lately contained a vote of 300,000 marks as the first installment of financial assistance to the mercantile marine under the Restoration Bill.

These are but a few of the methods by which Germans hope to win back their trade. America must be prepared for stupendous efforts and the keenest competition and our first endeavors should involve legislative preparations and the immediate plans for combination under the Webb-Pomerene law.

A Submarine for Raising Ships

(Concluded from page 571)

the same magnetic grip the submarine can be slightly shifted by a gear arrangement so as to drill more holes. An ingenious external arm permits the cable of the pontoon to be passed through these holes, thus affording a sure fastening. When a sufficient number of pontoons have been attached to the vessel, the electric pumps in those steel cylinders are started, forcing out the water and restoring their buoyancy. Slowly but surely the ship is raised to the surface; meanwhile, the operation can be supervised by the submarine crew peering through thick glass windows and directing the tender crew by telephonic means.

Protection Against the Submarine

(Concluded from page 572)

within the hull to take the explosion of the torpedo and dissipate its effect. The ship is provided with a double wall, the inner wall being very stoutly braced by means of curved girders, as shown. The space between this wall and the outer hull is filled with a material consisting of cement and cork, in such proportion that its specific gravity is equal to that of the water. Embedded within this material is a mat of cables, which is indicated by a black line in our drawing. When the torpedo is discharged it blows out a portion of the hull and exerts its force against the cables which will stretch to the position shown by dotted lines. The strain is taken partly by the cables and partly by the girders which form the backing for the inner wall. There is no loss of buoyancy

due to the fact that the filling material and the water are of the same specific gravity, and hence the vessel continues to sail on an even keel, although robbed of a portion of its hull.

In Fig. 4, we have an arrangement for preventing a ship that has been struck by a torpedo from sinking. The ship is provided with a series of air bags which may be pumped up to increase the buoyancy of the vessel when it starts to sink. By means of cables running over the side of the ship, these air bags may be carried down under water wherever needed to assist in supporting the vessel.

Trade Mark Larceny by the Enemy

By E. B. Marshall

AMERICAN manufacturers have been repeatedly warned that the enemy is practising the same methods to obtain, after the war, a place in the sun for their manufacturers as we have seen exhibited by their diplomats and generals. Not only are applications being filed for the registration of well known American trade marks in the important foreign countries by German and Austrian firms and by neutrals to be held in trust for the Germans and Austrians, but it now appears that applications are being filed in the interests of the enemy for the registration of American trade marks under the Berne Convention.

By a single registration under this Convention, a trade mark may be monopolized in thirteen different countries. Although Germany is not a member of this Convention and her citizens are not directly benefited by its provisions, and while many of the Convention countries are at war with Germany, this has not offered any real obstacle, for Austria is a member of the Berne Convention and her citizens may secure the desired registrations. This has been done in many noteworthy cases. Many applications are also being filed by citizens of neutral Convention countries for the registration of American trade marks which, it is believed, are to be held for use by the Germans.

First and last, it does not appear as though many things will be left undone, whatever their nature, to assist German firms to flood the markets of the world with German goods.

While the United States is not a member of the Berne Trade Mark Convention, and our manufacturers cannot obtain protection under its provisions, it is, nevertheless, possible for us to protect our foreign trade by registering our trade marks in the countries where we are doing business. This should be done and at once if we are to prevent our foreign trade from being stolen.

The Tonnage Puzzle

TO many who are not experienced with the ways of ships and ship-men, the various uses of the term tonnage in relation to the size of a ship are confusing in the last degree. There are four kinds of tonnage in use in shipping circles, and they all mean something—contrary to the land-lubber's impression—but they all mean something different.

Deadweight tonnage is what the vessel actually can carry in tons of heavy cargo, plus stores and bunker coal. Gross tonnage is based on the cubic contents of the hull, with certain arbitrary spaces deducted; accordingly it has little bearing upon the cargo-carrying capacity. Net registered tonnage is gross tonnage with further deductions on account of crew space and machinery space, and again has little bearing upon the dead-weight figures. Finally, the displacement is the total weight of the vessel when full of cargo, and accordingly represents the weight of her hull plus her deadweight tonnage. These two items can at least be made to appear reasonable to the most hopelessly non-technical mind by thinking of the hull—the ship herself—as live tonnage; displacement is then live tonnage plus the dead tonnage which can be piled onto the vessel.

In round numbers a ship of 9,000 tons deadweight would have a gross tonnage of 5,000 and a net registered tonnage of 3,000; she would displace 12,000 tons of water when fully loaded, so that figure represents her displacement.

Examine your truck investment for safety—earning—resale value

WHETHER you buy a single truck or a fleet of trucks, the investment is too big, too important to be lightly undertaken without measuring it carefully by these fundamental business standards.

Safety depends on:

whether the truck continues in service for years, and the company making it continues in business and stands behind it.

Earning depends on:

its suitability for the work it is to do, its carrying capacity and speed, and its ability to render uninterrupted service.

Resale value depends on:

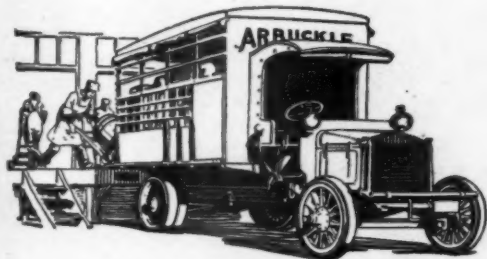
the demand for the truck in the second hand market and the proportion of its original price which it will command.

These factors are interdependent. They are reflected in the reputation of the truck and the company that makes it.

How does your prospective purchase measure up?

AN investment in Pierce-Arrow trucks is sound and can be demonstrated on these three points from the actual experiences of owners.

We do not depend on what we may say of our product, but on what owners say of their trucks—of their performance in daily use.



SAFETY The first Pierce-Arrow truck began commercial work, July 11th, 1911, for Arbuckle Bros. After four years it was sold to Brainerd Bros. of Jersey City, who operate it daily. It has run over 100,000 miles and is doing as good service today as the day it left the factory.

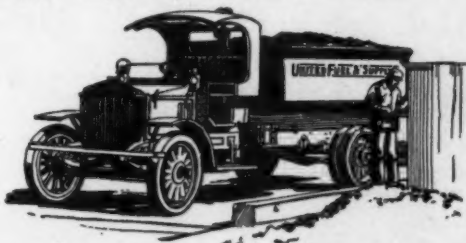
In 1911 Arbuckle Bros. bought five more Pierce-Arrows. They have since bought twenty-five and now operate twenty-nine. These five trucks have averaged over 65,000 miles. The first hundred trucks manufactured have now averaged in commercial service over 75,000 miles.

No Pierce-Arrow truck has ever worn out or become obsolete. The initial design was sound; the company has never marketed an experiment.

EARNING We have studied transportation conditions all over the country. We have data of actual operation in 103 different lines of business, so that we know what our trucks will do under all conditions of service. Our main interest in a sale is that it shall develop repeat orders. So we never sell a truck where it cannot make good.

for instance:

The United Fuel & Supply Co. of Detroit, selected four makes of trucks for competitive test in use. It bought 30 Pierce-Arrows on their record for general efficiency, low operating cost, and minimum of idle time. This happens repeatedly when tests are made.



The greater speed of the Pierce-Arrow enables it to carry a larger aggregate load in a given time; make more trips, than any other truck.



for instance:

Gera Mills haul their output from their factory near Passaic, N. J., to their salesrooms in New York by truck daily. A 5-ton Pierce-Arrow makes three round trips in a 9-hour

day, hauling 15 tons each way. 3-ton trucks, which it replaced, required two hours longer each day and carried only 9 tons each way.

This Gera Pierce-Arrow does 90% more work with a big saving in operation. Pierce-Arrows in contracting work average six trips against five of any competing truck, with consequent large earnings, in instances without number.

RESALE VALUE

Rarely is there a Pierce-Arrow in the second hand market. Occasionally trucks bought for emergency work are resold. Unusual conditions sometimes force sales.



for instance:

R. E. Wathen Company of Louisville, sold a Pierce-Arrow truck to the Schroer Transportation Company after five years continuous service for \$2800—a depreciation of only 7% a year. Of it, they wrote: "We would not have sold it at all had the Government not stopped the manufacture of whisky and we would gladly give \$3000 for another Pierce-Arrow in the same condition."

George Schroer writes of the truck: "The truck was in excellent condition and we were glad to give \$2800 for it. We consider it an extremely good purchase and it is doing the work as satisfactorily as the new trucks we have purchased."

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AMERICAN DREADNOUGHTS PLACED BY COURTESY AT THE HEAD OF THE BRITISH BATTLESHIP LINE [See page 591]

The Daily News

News Editorials Advertisements

VOL. XXXI. - NO. 203

ONE CENT

What town will be next?

JUST think back. How often has your newspaper, fresh from the press, cried out the news of another fire and for days after, fed you piecemeal the whole tragic story of death, loss, privation and distress?

Fate seems to time these shocks by some weird schedule so that ere one horror dulls in memory, it strikes again.

What town will be next? Who knows? It may be a quiet hamlet, or a busy factory town helping to build America. It may be a great city.

But the day is coming when we shall not consider what town will be the next, because roofs will be fire-safe. Buildings will no longer be topped with tinder, and when that day comes, fire's path will be blocked. You can see this working out in your town.

Up the street there's a cottage shingled with Johns-Manville

Asbestos. Through the trees you see a stately mansion with its beautiful roof of these same shingles in specially blended colors. Here's a garage—over there a great factory with a roof of the same material. All Johns-Manville Asbestos. All roofed for safety.

The demand for the fire-safe roof is growing fast, and with your own interest at heart you can help it by using any of the roofings listed below.

Johns-Manville Asbestos Roofings; Asbestos Built-Up Roofing; Asbestos Ready Roofing; Corrugated Asbestos Roofing; Colorblende Shingles; Transite Asbestos Shingles.

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